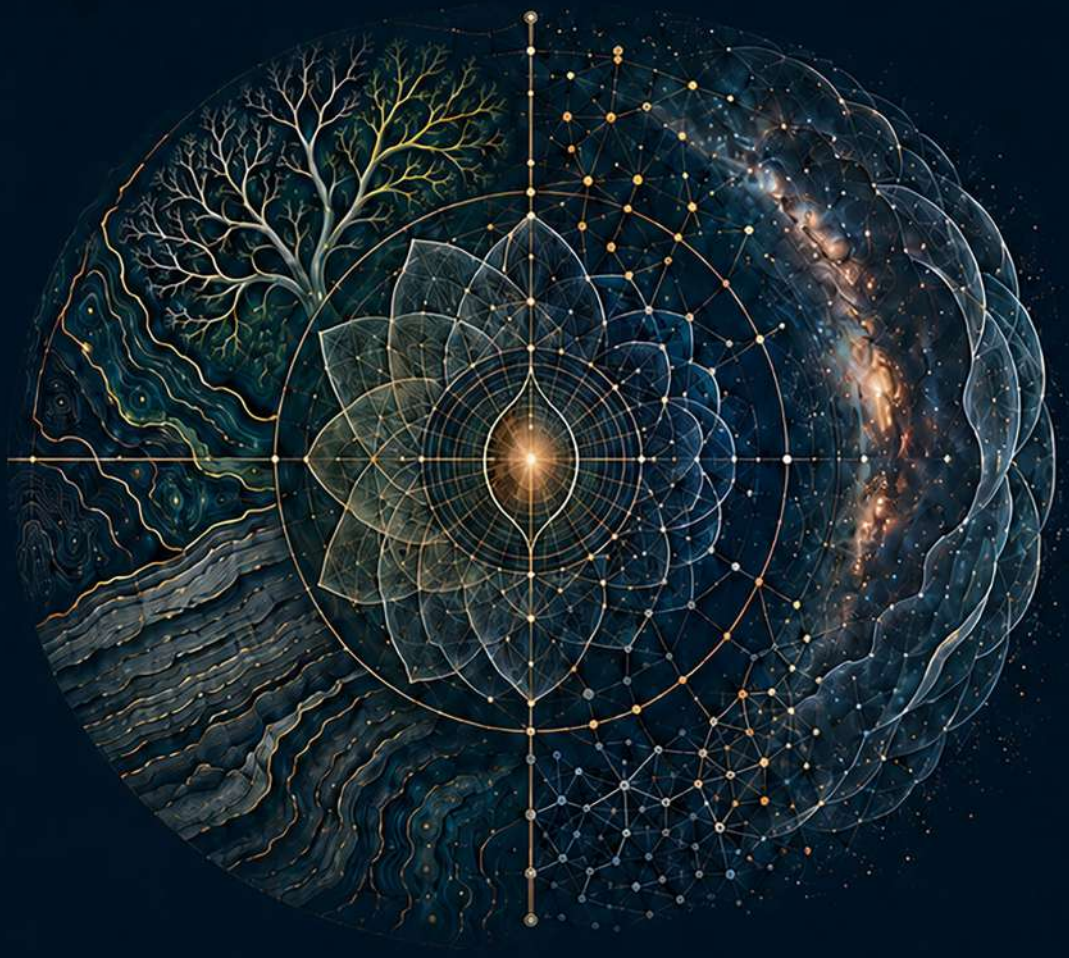
Aibek Alikulov

The Hypothesis of the Unified Matrix of the Universe:
Morphogenesis, Self-Organisation, and Universal Invariants of Form



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Introduction

11. General Statement of the Problem

Modern science has amassed an enormous body of knowledge about the forms, structures and processes that arise in nature. Biology describes the development of an organism from a cell and the formation of tissues, organs, leaves, flowers, vascular networks and neural networks. Geology investigates the folding of the Earth's crust, faults, river channels, mountain systems, crystalline structures and multilayered rock formations. Cosmology studies the distribution of matter on the scale of stellar systems, nebulae, galaxies and the large-scale structure of the Universe. The physics of complex systems examines self-organisation, non-linearity, fluctuations, phase transitions and the emergence of order from non-equilibrium states. The philosophy of nature, in turn, seeks to comprehend the very recurrence of form as an indication of a profound underlying order in being.

Despite the richness of these fields, however, a substantial divide remains between them. Each discipline possesses its own language, methods, explanatory models and range of permissible analogies. The biologist speaks of morphogenesis; the geologist, of tectonic deformation and erosion; the physicist, of self-organisation and non-equilibrium dynamics; the mathematician, of fractality and symmetry; the cosmologist, of gravitational structures and the distribution of matter; and the philosopher, of form, becoming and wholeness. All these languages are productive within their respective domains, but they are rarely integrated into a unified system of description.

It is here that the fundamental problem of the present study arises. In different domains of nature, we repeatedly encounter similar structural features: a centre, an axis, a spiral, radial unfolding, branching, layering, a scalloped or serrated edge, self-similarity, rhythmic articulation and fractal organisation. These features manifest themselves in biological forms — flowers, leaves, seeds, fruits, succulents, vascular networks and neural networks. They are also found in geological structures — mountain folds, river systems, coastlines, faults, stone textures, and volcanic and underwater formations. Similar principles can also be observed in cosmic objects: nebulae, spiral galaxies, stellar clouds, shells produced by explosive processes, and gas-and-dust structures. Finally, the same motifs persist in cultural artefacts: representations of the World Tree, ancient bas-reliefs, rosettes, mandalas, yantras, ornaments and other symbolic systems.

Visual similarity alone, of course, does not constitute evidence of a single physical mechanism. A flower and a nebula cannot be reduced to one another. A plant leaf and a mountain valley belong to different levels of the organisation of matter, form in different environments, operate on different timescales and are governed by different causal systems. Biological growth, tectonic pressure and cosmic expansion cannot unconditionally be described as one and the same process. Such a straightforward identification would be methodologically unsound and scientifically vulnerable.

Yet it would be equally mistaken to disregard the recurrence of morphological patterns itself. If similar structural configurations regularly arise in different environments, at different scales and under different physical conditions, this phenomenon requires examination. It may involve not a single material mechanism but a more general level of organisation: recurrent principles of form

generation realised in different substrates. In other words, the similarity may be morphogenetic rather than directly causal: different systems may exhibit analogous modes of transition from a disordered or potential state to a stable, articulated and reproducible form.

Modern science therefore requires an integrative language for describing form generation. Such a language should not supersede individual disciplinary explanations. On the contrary, it should make it possible to compare them without sacrificing their specificity. Biological morphogenesis must remain biological, geological folding geological, and cosmic structure cosmic. Yet a common level of analysis can be identified among them: the level of form, structure, symmetry, self-similarity, boundary, centre, axis, layer and stage of unfolding. This level does not replace physics, biology or geology, but connects them within a broader morphological perspective.

The problem is further complicated by the fact that form has long been perceived either as the external envelope of an object or as a secondary characteristic in relation to substance, function or process. In complex systems, however, form is not a superficial outcome. It expresses the mode of a system's internal organisation. Form reveals how stresses are distributed, how flows are directed, how connections are structured, how the system interacts with its environment, where its centre lies, how it maintains its integrity and how it passes into its next state. The study of form is therefore not an aesthetic supplement to science, but an independent means of understanding the organisation of matter.

Morphogenesis — the process through which form arises and develops — acquires particular importance in this context. In biology, morphogenesis is traditionally associated with the development of an organism, tissue structures, organs and the spatial organisation of the living body. The principle of morphogenesis itself, however, may be considered more broadly: as a transition from a potential structure to a manifest one, from relative homogeneity to differentiation, from symmetry to complex asymmetry, and from a closed nucleus to a branching system. In this expanded understanding, morphogenesis becomes not only a biological term but also an interdisciplinary category that makes it possible to discuss the formation of structures in different domains of nature.

Theories of self-organisation have made an important contribution to this understanding. They have shown that order can arise without an external architect, from the dynamics of the system itself. Non-equilibrium processes, feedback loops, local interactions, fluctuations and environmental constraints can produce stable structures. A. Turing's classical reaction-diffusion model demonstrated that spatial patterns can arise from a homogeneous state through the interaction of an activator and an inhibitor. B. Mandelbrot's fractal geometry provided a language for describing natural complexity, in which a part reproduces the principle of the whole and form remains recognisable as scale changes. Synergetics elucidated the mechanisms through which order emerges in non-equilibrium systems. Biomechanical and holistic approaches have shown that the form of a living organism depends not only on its genetic programme, but also on stresses, fields, mechanical connections, boundaries and interactions across levels.

These fields have already brought science closer to understanding that natural form is not the accidental outcome of numerous independent factors. It arises through the coordinated functioning of a system. Yet even these approaches are most often applied within separate fields. Turing-type models are used primarily in biology and chemistry; fractality in mathematics, physiology, geology and cosmology; tensegrity in biomechanics; and synergetics in physics and complex systems theory. A unified conceptual bridge has yet to be constructed between them

that would make it possible to consider form generation as a general problem concerning the organisation of matter.

The hypothesis of the Unified Matrix of the Universe arises precisely within this problem field. It does not deny existing scientific theories or claim to replace them. Its purpose is different: to propose a meta-theoretical framework within which different models of self-organisation and morphogenesis can be regarded as particular expressions of a more general structural logic. In this context, the term 'Matrix' denotes neither a material substance nor a mystical principle, but a hypothetical universal order of form generation manifested through recurrent morphological invariants.

These invariants include the centre, axis, symmetry, symmetry breaking, layering, branching, radiality, spirality, a scalloped or serrated edge, self-similarity and staged unfolding. These features should not be understood as an arbitrary collection of superficial resemblances. Each has structural significance. The centre marks the initial concentration of form and potential. The axis establishes the direction of development and maintains the connection between levels. Layering reveals the staged character of unfolding. Branching expresses the transition from unity to multiplicity. Radiality denotes the propagation of form from the centre towards the periphery. Spirality indicates growth through rotational displacement and repetition. The edge is the zone in which the system comes into contact with its environment and where morphogenetic tension reaches its maximum. Self-similarity shows that the general principle can be reproduced within the parts. Staged unfolding makes it possible to regard form not as a static object, but as a process.

In this sense, the principal research problem may be formulated as follows: why do similar structural forms — the centre, axis, spiral, branching, radiality, layering and fractality — recur at different levels of the organisation of matter? Is this recurrence an accidental consequence of human perception, which is predisposed to see similarity where none exists? Or does it indicate the existence of objective principles of self-organisation that manifest themselves differently in different environments while retaining a common morphological logic?

There can be no simple answer to this question. It requires both caution and theoretical boldness. Caution is necessary to prevent visual analogies from being turned into spurious evidence. Theoretical boldness is necessary to avoid dismissing the problem merely because it extends beyond the boundaries of any one discipline. The history of science shows that major shifts have often occurred precisely where a new language emerged for describing facts that were already known but remained disparate. This was the case with the concept of the field, systems theory, cybernetics, fractal geometry and synergetics. Each of these fields made it possible to perceive commonality where previously only separate cases had been recognised.

The present study proceeds from the assumption that form may become a similarly unifying concept. This does not mean form as outward appearance, but form as a mode of organisation, a trace of a process and the structural memory of a system. A flower, a stone, mountainous relief, a nebula, an ancient ornament or the symbol of the World Tree may then be regarded not as equivalent objects, but as different bearers of morphological principles. Their comparison requires a strict hierarchy: models from the natural sciences must be distinguished from philosophical interpretations, and cultural symbols from empirical data. Provided that this hierarchy is observed, however, the comparative study of forms may reveal a new level of understanding of natural and cosmic organisation.

Thus, the general statement of the problem concerns the need to develop an integrative language of morphogenesis: a language that can describe recurrent structural principles without conflating disciplines or oversimplifying their subject matter. The hypothesis of the Unified Matrix of the Universe proposes that the diversity of forms in nature and the cosmos may be regarded as a possible manifestation of universal regularities of self-organisation. At the heart of this hypothesis lies not the claim that all forms are literally identical, but the question of whether there is a common morphogenetic order through which different systems arrive at similar structural solutions.

It is this question that determines the subsequent logic of the study. First, the scientific and philosophical foundations of the problem of form must be examined. The concepts of self-organisation, morphogenesis, fractality and symmetry must then be clarified. This will make it possible to proceed to the formulation of the hypothesis itself and its key models: the 'circle-seed', 'leaf-like unfolding' and stages A–B–C–D. It will then be necessary to demonstrate how these models may be used to analyse biological, geological, cosmic and cultural-symbolic structures. Finally, it will be necessary to determine which propositions of the hypothesis are amenable to scientific testing and which remain within the domain of philosophical interpretation.

This structure makes it possible to regard the hypothesis of the Unified Matrix of the Universe not as a completed dogma, but as a research programme. Its scientific significance will depend not on the evocative power of its imagery, but on its ability to identify stable invariants, propose methods for describing them, distinguish observation from interpretation and establish a basis for further testing. This is the principal aim of the study: to move from an impression of similarity to a disciplined analysis of form, from disparate analogies to a morphological theory, and from a philosophical image to a possible scientific model of universal form generation.

2. Relevance of the Study

The relevance of the hypothesis of the Unified Matrix of the Universe derives not from a desire to add yet another metaphor to existing conceptions of nature, but from the need to comprehend the broad range of phenomena that modern science increasingly describes in terms of self-organisation, complexity, fractality, symmetry, morphogenesis and holistic structure. As our knowledge of living, geological and cosmic systems advances, it becomes increasingly apparent that nature is not a collection of isolated objects. It manifests itself as a totality of processes in which form arises, becomes more complex, stabilises, disintegrates and is reproduced under new conditions. It is precisely this processual logic of form that requires dedicated study.

The scientific picture of the world changed substantially during the twentieth and twenty-first centuries. Whereas classical science often sought to explain the complex by decomposing it into simple elements, contemporary knowledge increasingly addresses systems in which the properties of the whole cannot be reduced to the sum of their parts. A living cell, organism, ecosystem, mountain massif, planetary atmosphere, galactic structure or cultural symbol cannot be understood solely through a list of its constituent elements. In each case, it is necessary to consider connections, levels, feedback effects, the distribution of stresses, energy exchange, boundaries, internal dynamics and the history of formation. Consequently, the

question of how an object is organised comes to the fore alongside the question of what it consists of.

The growing interest in complex systems and theories of self-organisation constitutes the first basis for the relevance of the present study. Modern science increasingly encounters objects that cannot be described linearly. They develop through fluctuations, threshold states, symmetry breaking, feedback loops, local interactions and transitions between regimes. Such systems can generate order not because it has been imposed on them from outside, but because their internal dynamics lead to the formation of stable structures. This principle is important in physics, chemistry, biology, geology, climatology, neuroscience, cosmology and even the social sciences.

Self-organisation has therefore ceased to be a narrowly specialised concept. It has become one of the key conceptual languages of modern science. It is used to describe chemical patterns, tissue growth, the development of biological forms, the behaviour of colonies of organisms, the formation of river networks, the development of vortices, the organisation of neural connections and the distribution of matter on cosmic scales. Different fields address different mechanisms, but the general question remains similar: how does an integrated structure arise from a multitude of interacting elements? The hypothesis of the Unified Matrix of the Universe enters precisely this field of inquiry by proposing that form should be considered the result of universally significant processes of self-organisation.

The second basis for the study's relevance concerns the need to compare biological, geological and cosmic forms. Modern science has accumulated vast quantities of visual and quantitative data. Microscopy, satellite imaging, telescopic observations, digital elevation models, computed tomography, astrophotography and complex-system modelling allow us to observe natural forms at scales that were inaccessible until relatively recently. It has become possible to compare the structure of a leaf, the pattern of a river network, the folding of mountains, the form of a nebula, the distribution of galactic arms and the structure of an organism's vascular system not only at the level of visual impression, but also in terms of measurable features.

Such comparison does not entail the conflation of disciplines. Biological form arises in living tissue; geological form results from prolonged processes of pressure, erosion, crystallisation and tectonic activity; and cosmic form arises under the influence of gravity, radiation, shock waves, gas dynamics and other physical factors. Despite the differences between their causal mechanisms, however, the forms themselves sometimes display remarkably similar structural solutions: branching, radial unfolding, spirality, layering, the repetition of modules, fractal organisation, an active periphery and the transition from a dense centre to an unfolded structure. These correspondences call not for a hasty conclusion about the 'unity of everything', but for a rigorous formulation of the question: are there general morphological principles that are realised differently in different environments?

In this sense, the hypothesis of the Unified Matrix of the Universe is relevant as an attempt to formulate a language for comparative morphology across levels. It proposes that biological, geological and cosmic forms should be regarded not as equivalent in origin, but as comparable in their structural organisation. This approach makes it possible to identify invariants: the centre, axis, layer, edge, branching, radiality, spiral and self-similarity. These invariants may subsequently be examined quantitatively through morphometrics, fractal analysis, geometric descriptions of contours and statistical comparison. Visual analogy is thereby transformed not into evidence, but into the source material for rigorous analysis.

The third basis for the study's relevance lies in the importance of fractal geometry for describing natural structures. Classical Euclidean geometry provides an excellent description of ideal lines, planes, circles, polyhedra and regularly shaped solids. Real nature, however, is rarely perfectly smooth. A coastline is irregular, a cloud has an uneven contour, a tree branches, a leaf contains a network of veins, the lungs and vascular systems form repeatedly branching structures, a mountain massif consists of folds and faults, and a nebula has a complex periphery. Describing such complexity requires a different language: the language of self-similarity, scale invariance, fractional dimension and recurrent structural motifs.

Fractal geometry has become one of the most important instruments for providing such a description. It has shown that the complexity of form is not necessarily random. On the contrary, many natural structures possess an internal order that recurs at different scales. The branching of a tree and a vascular system, the pattern of a fern, mountainous relief, the distribution of clouds, the structure of lightning, the bronchial tree, coastlines and certain cosmic structures may all be examined using fractal models. This does not mean that they are all one and the same object. It does mean, however, that similar principles of geometric organisation genuinely occur in different domains of nature.

Fractality is of fundamental importance to the hypothesis of the Unified Matrix of the Universe. It makes it possible to move from a figurative observation of similarity to a more rigorous description. If a part reproduces the principle of the whole, if a form retains its structural recognisability when scale changes, and if complexity arises through the iteration of relatively simple rules, then we acquire a scientific language for discussing self-similarity. In that case, the claim that form recurs ceases to be purely philosophical. It can be translated into the domain of measurement: fractal dimension, degree of branching, the distribution of elements, contour complexity, type of symmetry and the stability of a structure under changes of scale can all be analysed.

The fourth basis for the study's relevance concerns the inadequacy of purely reductionist models for explaining the wholeness of form. Reductionism has played an enormous role in the development of science. It has made it possible to decompose complex objects into their constituent elements, identify mechanisms, discover laws governing the interaction of parts and establish precise experimental methods. Modern biology, chemistry, physics, medicine and technology would be impossible without reductionist analysis. Reductionism nevertheless proves insufficient when the task is to explain not only the composition of a system, but also its organisation as an integrated whole.

The form of a living organism cannot be derived by simply adding molecules together. The structure of tissue cannot be reduced solely to a genetic programme. Relief cannot be explained by a single factor such as pressure or erosion. A cosmic nebula is not exhaustively described by listing the substances it contains. In every case, integrated form arises through complex interactions across levels. Lower levels provide the material and local processes, but higher levels — boundaries, fields, stresses, geometric constraints and modes of exchange — also influence the behaviour of the parts. A contemporary understanding of morphogenesis therefore requires not the abandonment of the analysis of elements, but its supplementation with systemic and holistic perspectives.

This is particularly evident in biology. Genetic information is important, but it is not the sole source of form. The development of an organism depends on mechanical stresses, chemical gradients, electrical potentials, spatial constraints, intercellular interactions, the environment

and time. Form arises not as the straightforward execution of a blueprint recorded in advance, but as a process that coordinates a multitude of factors. In this sense, morphogenesis is not only a biochemical process, but also a physical, geometric, informational and systemic one.

The same logic applies more broadly. Geological form is not a mechanical sum of rocks; it expresses a history of stresses, movements, destruction, sedimentation and stabilisation. Cosmic form is not an accidental cloud of matter; it often records the interaction of gravity, pressure, radiation, rotation, explosive processes and the surrounding environment. In a cultural artefact, form likewise cannot be reduced to its material: it preserves a structure of perception, a symbolic order, observations of nature and ways of recording cosmic or biological analogies. In every case, the whole possesses a logic of its own that cannot be fully replaced by an analysis of its individual parts.

The hypothesis of the Unified Matrix of the Universe is relevant because it addresses precisely the wholeness of form. It proposes that form should be considered the result of an internally interconnected process in which elements, levels, boundaries, axes, centres, layers and the periphery stand in definite relationships. This does not negate particular mechanisms, but makes it possible to discern a more general structural scenario behind them: a closed state, the onset of unfolding, the formation of layers, differentiation, branching, extension towards the periphery, reproduction and transition to a new cycle. This scheme requires testing, but the very formulation of the question corresponds to the contemporary movement of science away from the analysis of isolated elements and towards the study of complex wholes.

The fifth basis for the study's relevance concerns the possibility of bringing together scientific and philosophical approaches to the problem of morphogenesis. Science provides methods of testing, measurement, modelling and the description of mechanisms. Philosophy makes it possible to retain the broader meaning of the problem and to work with the categories of form, becoming, wholeness, symmetry, potentiality and actualisation. If these approaches exist in isolation, one-sidedness arises. Purely philosophical reasoning risks losing its connection with testable data. A purely empirical description may accumulate numerous facts without addressing the question of their common structure. A productive study of morphogenesis therefore requires these approaches to be brought together with care.

Such a synthesis is particularly important for hypotheses that operate at disciplinary boundaries. The hypothesis of the Unified Matrix of the Universe inevitably has a dual nature. On the one hand, it draws upon scientific models: self-organisation, fractality, reaction-diffusion processes, biomechanics, and geological and cosmological structures. On the other hand, it works with philosophical concepts: form, becoming, order, wholeness, the hidden and the manifest, potential and unfolding. If these levels are not distinguished, the hypothesis will become vague. If they are separated too sharply, it will lose its integrative power. The task of the study is therefore to construct a disciplined bridge between them.

In this respect, the study is relevant not only as an exposition of an individual authorial idea, but also as an attempt to propose a methodology for working with interdisciplinary hypotheses. Modern science increasingly encounters such boundary problems, for which a single disciplinary language proves inadequate. Consciousness, life, complexity, form, evolution, information, self-organisation and wholeness all require the combined efforts of the natural sciences, mathematics, philosophy and the humanities. The hypothesis of the Unified Matrix of the Universe belongs precisely to this class of problems: it cannot be properly developed as pure

philosophy, as a collection of visual analogies or as a narrow scientific model. It requires a distinctive form of methodological synthesis.

The relevance of the study is also connected with the crisis caused by the fragmentation of knowledge. Scientific specialisation has produced enormous results, but it has also led different fields of knowledge to describe similar processes in different terms and often fail to recognise the possibility of comparison. Biology speaks of morphogenetic fields and developmental patterns; geology, of structural forms and the dynamics of relief; cosmology, of the distribution of matter and gravitational structures; mathematics, of fractals and scale invariance; and philosophy, of the becoming of form. Genuine points of intersection exist between these fields, but they frequently remain unarticulated.

An integrative approach to morphogenesis may offer one means of overcoming this fragmentation. It should not reduce different sciences to a single universal scheme. Such unification would be both dangerous and reductive. The aim is different: to create a common conceptual level on which recurrent structural principles can be discussed without any loss of specificity. If it can be demonstrated that the centre, axis, layer, edge, branching, fractality and staged development genuinely have significance in different systems, it becomes possible to construct a comparative morphology of nature and culture.

The hypothesis acquires particular relevance in the context of advances in digital image analysis and big data. It is now possible to assemble large datasets of natural and artificial forms, classify them according to structural features, measure contours, calculate fractal dimensions, detect symmetry, construct models of growth and perform machine-based comparisons of forms. What previously remained within the realm of intuitive visual comparison can gradually be transferred into the domain of computational analysis. This opens the possibility of subjecting the hypothesis of the Unified Matrix of the Universe to more rigorous testing.

It is important to emphasise that the relevance of the study does not mean that the hypothesis has been proven. On the contrary, the scientific significance of the work begins precisely with recognition of its hypothetical status. The hypothesis must be formulated in such a way that it is clear which of its propositions can be tested, which require mathematical formalisation, which belong to philosophical interpretation and which constitute the author's figurative language. Only such a distinction will prevent science, symbolism and metaphor from being conflated. If this distinction is maintained, however, the hypothesis may become a productive research programme.

Thus, the relevance of the present study is determined by several interrelated considerations. First, modern science is increasingly turning towards complex systems and self-organisation. Second, the available data make it possible to compare forms at the biological, geological and cosmic levels. Third, fractal geometry provides a language for describing natural complexity and self-similarity. Fourth, reductionist models need to be supplemented by a systemic and holistic analysis of form as an integrated whole. Fifth, the philosophy of nature and the natural sciences can be brought together within the common problem of morphogenesis.

The hypothesis of the Unified Matrix of the Universe is relevant precisely because it seeks to operate at the intersection of these fields. Its purpose is not to replace existing scientific explanations, but to propose a way of discerning structural connections between them. If form is indeed one of the universal languages of nature, its study may provide new material for understanding the organisation of matter, life, the cosmos and human symbolic culture. This constitutes the scientific and philosophical significance of the proposed study.

3. Object and Subject of the Study

Correctly defining the object and subject of the study is of fundamental importance to the entire investigation, since the hypothesis of the Unified Matrix of the Universe lies at the intersection of several fields of knowledge. It simultaneously draws upon biology, geology, cosmology, the physics of complex systems, the philosophy of nature and cultural morphology. It is therefore necessary, from the outset, to state clearly what is being studied, at what level the analysis is conducted and which features are regarded as central.

The object of the present study comprises the processes of form generation and self-organisation in natural, biological, geological, cosmic and cultural-symbolic systems. This definition immediately moves beyond a narrow understanding of form as an external contour or visual resemblance. The focus is not on the static image of an object, but on the process through which a structure arises, develops, becomes more complex, stabilises and passes into a new state. In other words, the object is not merely form as an outcome, but form generation as a dynamic process.

In the present study, processes of form generation are understood as changes within a system through which a relatively simple, homogeneous, closed or potential state gives rise to an articulated, ordered and morphologically manifest structure. This may involve the growth of a plant, the opening of a bud, the formation of a leaf, the branching of a vascular network, the formation of a mountain fold, the development of a river system, the crystallisation of a mineral, the expansion of a gas-and-dust nebula, the organisation of a spiral galaxy or the emergence of a stable symbolic motif in culture. All these processes differ in nature, but each involves a transition from a state in which form is less pronounced to one of greater structural definition.

Within the present study, self-organisation is regarded as the capacity of a system to generate internal order without direct external design. This does not imply the absence of external conditions. On the contrary, every system develops within an environment and is affected by pressure, temperature, gravity, chemical gradients, flows of matter and energy, biological programmes, cultural traditions or symbolic codes. The decisive point, however, is that form is not simply imposed from outside. It arises through the interaction of internal and external factors and through the coordination of elements, boundaries, stresses, directions of growth and levels of organisation.

Biological systems provide the clearest material for this type of analysis. A seed, bud, flower, leaf, fruit, vascular network, neural structure, coral, shell or bodily tissue demonstrates that form develops in stages. It possesses a centre, direction, boundaries, layers, zones of growth, internal lines of stress and peripheral regions of unfolding. Biological morphogenesis is particularly important to the hypothesis because the transition from a hidden structure to a manifest form can be observed directly: a plant develops from a seed, a flower opens from a bud, tissue forms through cellular interactions, and organic wholeness arises from recurrent modules.

Geological systems introduce a different scale and a different temporal depth. Here, form generation occurs not at the pace of biological growth, but through prolonged processes of pressure, folding, crystallisation, erosion, faulting, sedimentation and tectonic displacement. A stone, rock, landform, valley, ridge, river network or underwater structure does not grow in the biological sense. Nevertheless, such formations also record transitions of matter from one state to another, as well as the formation of layers, lines of stress, folds, waves, ruptures, edges and

recurrent structural motifs. Geological material is therefore important as evidence that morphological organisation is not confined to living nature.

Cosmic systems extend the object of the study to the largest scales. Nebulae, galaxies, stellar clouds, shells produced by explosive processes, spiral structures and the distribution of cosmic matter demonstrate that form also arises under conditions radically different from biological and terrestrial ones. Gravity, radiation, shock waves, rotation, gas dynamics, magnetic fields, star formation and processes of disruption operate at this level. Nevertheless, cosmic objects frequently display centred organisation, radiality, spirality, layering, ruptures, scalloped edges, cloud envelopes and branching configurations. This does not permit the cosmos to be identified with a living organism, but it does make morphological comparison across levels possible.

Cultural-symbolic systems occupy a special place within the object of the study. They include archaic images, bas-reliefs, ornaments, rosettes, mandalas, yantras, representations of the World Tree, sacred geometries and other forms through which order is visually recorded. The intention here is not to replace archaeology, art history or the history of religions with arbitrary interpretation. Cultural material is approached cautiously, as a domain in which human consciousness may have recorded, generalised and symbolically reproduced observed natural structures. Cultural forms are therefore included in the object of the study not as direct evidence of a natural law, but as a distinctive layer of morphological memory and visual thought.

Such a broad understanding of the object requires methodological discipline. A biological organism, mountain fold, nebula and ancient bas-relief cannot be analysed as objects of the same kind. They differ in their material constitution, origin, scale, duration and causal mechanisms. They can, however, be compared at the level of structural features. It is precisely this level that defines the subject of the study.

The subject of the study consists of universal morphogenetic invariants manifested in different systems: the centre, axis, symmetry, asymmetry, layering, fractality, self-similarity, branching, radiality, spirality and staged unfolding of form. In this context, an invariant is not an unchanging material detail, but a recurrent structural principle capable of being realised in different environments and at different scales. The same invariant may have a biological, geological, cosmic or cultural-symbolic expression without losing its morphological significance.

The centre is one of the fundamental invariants. It denotes a region in which form, energy, matter, information or compositional meaning is concentrated. In biology, the centre may be represented by a seed, the core of a flower, a growth point, an embryonic region or a branching node. In geology, it may be the core of a structure, a zone of pressure, the centre of a fold, a crater, a dome or the initial region from which a process spreads. In the cosmos, it may be the luminous core of a nebula, the centre of a galaxy, a star-forming region or a gravitational concentration. In culture, it may be a central sign, the axis of a composition, the point from which an ornament originates or the sacred centre of an image. The centre is not always geometrically precise, but It establishes the initial organisation of form.

The axis is the second key invariant. It expresses the direction of development and the connection between the levels of a structure. In a plant, the axis manifests itself as a stem, the central vein of a leaf, the vertical line of a bud or the trunk of a tree. In geology, it may appear as the line of a valley, ridge, fault, tectonic stress or elongated fold. In cosmic forms, the axis may be expressed through the direction of an outflow, rotation, the symmetry of an envelope or the distribution of matter. In archaic images, the axis is often represented by a staff, the trunk of the World Tree, the

vertical line of a figure or the central line of an ornament. Through its axis, a form acquires not only a position but also an internal direction.

Symmetry and asymmetry form a dialectical pair. Symmetry indicates order, equilibrium and potential wholeness. It is often associated with the initial state of a form, its closedness or stability. Asymmetry, by contrast, indicates the beginning of a process, the disruption of equilibrium and the transition towards development and individualisation. A living form is almost never perfectly symmetrical: even the most regular flower contains minor deviations that reveal the reality of growth. Geological and cosmic structures also rarely display ideal symmetry. Their order exists through a tension between regularity and deviation. It is therefore important for the hypothesis not to oppose symmetry and asymmetry, but to regard them as two states of a single morphogenetic process.

Layering is an invariant of the gradual unfolding of form. It demonstrates that a complex structure rarely arises instantaneously. Form accumulates levels, envelopes, zones, strata, rings, petals, folds and peripheral regions. In biology, layering is visible in the bud, flower, fruit, tree bark and bodily tissues. In geology, it appears in sedimentary rocks, mountain folds, crystalline formations and cross-sections of relief. In the cosmos, it is visible in nebular envelopes, waves of expansion and layers of gas and dust. In culture, it appears in mandalas, yantras, rosettes and multilevel ornaments. Layering indicates the memory of a process: each layer records a particular phase of becoming.

Fractality and self-similarity are invariants of recurrence across scales. Fractality means that a structure possesses a complexity that persists when the scale changes. Self-similarity indicates that the general principle is repeated within the parts. A tree branch resembles the tree as a whole, a small fern frond repeats the structure of a larger frond, a river tributary reproduces the logic of the river system, and small folds in mountainous relief reproduce the overall folding of the massif. Self-similarity manifests itself differently in cosmic structures, but it may also be associated with recurrent distributions, clusters and spiral configurations. This invariant is particularly important to the hypothesis because it makes it possible to discuss not outward resemblance, but the principle of structural recurrence.

Branching expresses the transition from unity to multiplicity. It is one of the most widespread modes of organising form. A plant branches from its trunk into branches and leaves. The vascular system branches from large vessels into capillaries. Neural structures form dendritic networks. A river system branches into tributaries. Faults and cracks may form branching configurations. The World Tree in cultural tradition embodies the same principle in symbolic form. Branching shows that development does not destroy the original unity, but transforms it into a system of multiple connections.

Radiality denotes the extension of form from the centre towards the periphery. It manifests itself in flowers, plant rosettes, marine organisms, crystals, craters, nebulae, stellate structures, ornaments and sacred geometries. Radial organisation is particularly important for understanding the process of unfolding: a closed centre unfolds outwards, creating a circular or ray-like structure. Radiality does not necessarily entail perfect regularity. It may be disrupted, displaced or partial while still retaining its connection with the centre.

Spirality represents development through rotation, displacement and repetition. A spiral is not merely a line. It combines forward movement with return, growth with cyclicity, and expansion with the retention of a centre. In nature, spirals occur in the arrangement of leaves, floral structures, shells, vortices, cyclones, galaxies, flows and ornaments. The spiral is important to

the hypothesis because it presents form as a process rather than as static geometry. A spiral structure always retains a trace of movement.

The staged unfolding of form is an integrative invariant that brings the other features together. It makes it possible to regard morphogenesis as a sequence of states: a closed form, the beginning of unfolding, partial differentiation, complete manifestation, reproduction and transition to a new cycle. In biology, this sequence is evident: seed, shoot, bud, flower, fruit and new seed. In geology, it is expressed less directly, but may be traced through the formation of a core, layering, deformation, rupture and structural stabilisation. In the cosmos, it manifests itself through phases of birth, expansion, destruction and redistribution of matter. In culture, it is recorded through the symbols of the circle, crescent, star, tree, lotus, rosette or mandala.

The subject of the study therefore cannot be reduced to a search for outwardly similar images. It consists in identifying and describing recurrent structural principles that may be found in different types of systems. For this reason, the hypothesis of the Unified Matrix of the Universe requires not only philosophical exposition but also the development of analytical tools: a classification of invariants, morphometric analysis, fractal description, comparative tables, visual series and models of staged development.

A crucial condition of scientific correctness is the distinction between the object and the subject of the study. The object is broad: it encompasses processes of form generation and self-organisation in different systems. The subject is more specific: it concerns not all the properties of these systems, but universal morphogenetic invariants in particular. The book does not seek to provide a complete explanation of the biology of a flower, the geology of a mountain fold, the physics of a nebula or the semantics of an ancient artefact. Its task is different: to identify which structural features recur in these different fields, determine the roles they perform and establish whether they can be described as elements of a unified morphogenetic logic.

This distinction makes it possible to avoid two extremes. The first is the excessive expansion of the hypothesis, in which every similarity is proclaimed evidence of a universal law. The second is the rejection of comparison merely because the objects belong to different disciplines. The present study adopts an intermediate position: it recognises differences between mechanisms while admitting the possibility of common morphological principles. It is precisely this position that makes the hypothesis open to further testing and scientific discussion.

Ultimately, the object and subject of the study establish the principal framework for the entire investigation. The object indicates where the problem unfolds: within the processes through which natural, biological, geological, cosmic and cultural structures are formed. The subject indicates what precisely is to be analysed within these processes: the centre, axis, symmetry, asymmetry, layering, fractality, self-similarity, branching, radiality, spirality and staged unfolding. In the following chapters, these invariants will serve as analytical reference points in the examination of specific materials and visual series.

4. Aim of the Study

The aim of the present study is to present and conceptually substantiate the hypothesis of the Unified Matrix of the Universe as an interdisciplinary model of a universal morphogenetic order

manifested in the recurrence of forms and processes at different levels of the organisation of matter.

This definition of the aim requires clarification. The intention is not to create a complete theory that already possesses an exhaustive mathematical apparatus and has undergone full experimental verification. At this stage, the hypothesis of the Unified Matrix of the Universe is regarded as a research programme requiring rigorous exposition, methodological clarification, a classification of features and the development of methods for further testing. The purpose of the study is therefore not to declare the existence of a universal law conclusively proven, but to demonstrate that the very formulation of the question of a unified morphogenetic order has both scientific and philosophical foundations.

The book seeks to translate the author's intuition concerning the recurrence of forms into a more rigorous conceptual language. The original idea underlying the hypothesis centres on an observation: similar structural motifs repeatedly arise in nature, the cosmos and culture — the circle, centre, axis, spiral, branching, unfolding, layering, fractality, radiality and the transition from a closed state to an open form. These motifs may be seen in the seed and flower, leaf and tree, stone and mountain fold, river network and underwater relief, nebula and galaxy, ancient bas-relief and sacred geometry. Scientific inquiry, however, begins not with the similarity itself, but with the question of how that similarity should be understood.

The aim of the study is therefore to provide a conceptual substantiation of the hypothesis by constructing an explanatory framework capable of distinguishing a chance visual analogy from a recurrent morphological invariant. The hypothesis must be presented not as a collection of impressions, but as a system of concepts in which every key term — 'Matrix', 'morphogenesis', 'circle-seed', 'leaf-like unfolding', 'self-similarity', 'active edge' and 'stage of unfolding' — acquires a defined meaning and place within the overall logic of the study.

In this book, the Unified Matrix of the Universe is understood neither as a physical object, a hidden substance nor a mystical force governing the Universe from outside. It is essential to emphasise this point in the introduction. The Matrix is regarded as a hypothetical structural logic of form generation that may manifest itself through similar modes of organising matter: concentration around a centre, development along an axis, disruption of an initial symmetry, the formation of layers, branching, radial propagation, spiral displacement, fractal recurrence and transition to a new stage of a cycle. Understood in this way, the Matrix is not an object of faith, but a conceptual model intended for the analysis of forms.

The study also aims to demonstrate the interdisciplinary nature of this model. The hypothesis of the Unified Matrix of the Universe cannot be fully developed using the resources of a single science. Biology provides material for understanding growth, development, morphogenesis, tissue, organs, seeds, flowers and organisms. Geology reveals slow forms of the self-organisation of matter: layers, folds, faults, crystalline structures, relief and underwater formations. Cosmology reveals a scale at which similar morphological features appear in gas-and-dust clouds, nebulae, galactic structures and distributions of matter. Fractal geometry provides a mathematical language of self-similarity. The physics of complex systems explains the emergence of order from non-equilibrium states. The philosophy of nature helps preserve the integral meaning of the problem of form, becoming and structural recurrence.

The aim of the study therefore has a dual character. On the one hand, it is scientific: to identify, describe and systematise recurrent morphogenetic features in different classes of systems. On the other hand, it is philosophical: to consider whether the recurrence of these features may

indicate a more general order of form generation than is usually examined within individual disciplines. This duality is not a weakness of the study. On the contrary, it corresponds to the nature of the problem itself, since form always lies at the boundary between the measurable and the interpretable: it can be analysed geometrically, but cannot be fully understood apart from process, function, environment and wholeness.

The transition from visual material to an analytical model is particularly important in fulfilling the aim of the study. Images of flowers, stones, landforms, nebulae, bas-reliefs, the World Tree, crop circles and sacred geometries must not be used as direct evidence for the hypothesis. Their role is different: they form a corpus of observations from which recurrent features may be identified and comparative series constructed. The images themselves may be visually persuasive, but the scientific task is to translate visual persuasiveness into the language of features, classifications, concepts and possible methods of testing.

In this sense, the study also aims to protect the hypothesis from two opposing distortions. The first is excessive mystification, in which every similarity is proclaimed a manifestation of a hidden universal code. Such an approach makes the hypothesis striking, but deprives it of scientific robustness. The second distortion is excessive narrowing, in which all interdisciplinary comparisons are rejected merely because the objects belong to different fields of knowledge. Such an approach preserves disciplinary rigour but closes off the possibility of recognising a common morphological problem. The book must navigate between these extremes: it must preserve scientific caution without losing the scope of the author's idea.

The ultimate aim of the study may therefore be formulated as follows: to develop a scientific and philosophical foundation for the hypothesis of the Unified Matrix of the Universe as a model that makes it possible to consider the diversity of natural, geological, cosmic and cultural forms through the prism of recurrent morphogenetic invariants. Achieving this aim entails not only presenting the hypothesis, but also creating a methodological basis for its subsequent testing, refinement and development.

5. Principal Research Tasks

Achieving the stated aim requires the completion of several interrelated tasks. These tasks form the internal logic of the study and determine the sequence of its chapters: from a general philosophical and scientific statement of the problem to the formulation of the hypothesis; from theoretical foundations to the analysis of visual series; and from morphological comparisons to a methodology of verification and the determination of the limits of applicability.

The first task is to formulate the hypothesis of the Unified Matrix of the Universe in scientific and philosophical terms. This requires translating the author's original idea from an intuitive observation and figurative description into a system of concepts. The hypothesis must acquire clear terminology, an internal structure, logical consistency and methodological limitations. It is necessary to define what is meant by the 'Matrix', why it is described as unified, in what sense it relates to the Universe, how it is connected with morphogenesis and why it cannot be reduced either to a mystical symbol or to a purely artistic metaphor.

Formulating the hypothesis also requires clarification of its central models: the 'circle-seed', 'leaf-like unfolding' and the stage-based A–B–C–D scheme. These models must be presented not

as arbitrary images, but as analytical constructs describing the transition of form from a closed potential state to a multilevel, articulated structure capable of reproduction. It is important to demonstrate that the circle, seed, bud, leaf, flower, branching pattern and spiral function within this hypothesis not only as symbols, but also as morphological schemes.

The second task is to examine contemporary theories of morphogenesis, self-organisation and fractality. Without this, the hypothesis would remain an isolated authorial concept. It must be situated within the context of existing scientific fields. The book must consider the reaction-diffusion model of morphogenesis, ideas of self-organisation in non-equilibrium systems, the fractal geometry of nature, complex systems theory, biomechanical conceptions of tensegrity, holistic approaches to the development of living forms, and philosophical concepts of form, symmetry and becoming. This will demonstrate that the hypothesis has not arisen in a vacuum, but continues and generalises a range of questions already posed by modern science.

The task is not, however, merely to list theories mechanically. It is necessary to identify how each theory contributes to understanding a particular aspect of the hypothesis. The Turing model is important for explaining how patterns emerge from a homogeneous medium. Fractal geometry is important for describing self-similarity and recurrence across scales. Synergetics contributes to understanding order arising under non-equilibrium conditions. Holistic approaches make it possible to analyse the wholeness of form and the reciprocal influence of levels. The philosophy of nature allows form to be understood as a category of becoming rather than merely as an external contour.

The third task is to identify the key morphological invariants that recur in living and non-living nature. These invariants must become the analytical core of the study. They include the centre, axis, symmetry, asymmetry, layering, fractality, self-similarity, branching, radiality, spirality, the active edge and the staged unfolding of form. It is important not merely to name these features, but to demonstrate their structural functions. The centre concentrates the potential of form. The axis establishes direction. The layer records a phase of development. Branching transforms unity into multiplicity. The spiral combines growth and repetition. The edge reveals the interaction between form and its environment. Staged development makes it possible to perceive an object as a process.

Identifying invariants requires a transition from a descriptive to a comparative level of analysis. It is necessary to demonstrate how the same feature manifests itself in different systems. A centre, for example, may be the core of a flower, the nucleus of a stone structure, the luminous region of a nebula or the central point of an ornament. An axis may take the form of a stem, valley, staff depicted in a bas-relief or the direction of a cosmic outflow. Layering may appear in a bud, sedimentary rock, mountain fold, gas-and-dust envelope or mandala. This approach makes it possible to compare objects according to identified features without conflating the objects themselves.

The fourth task is to analyse BIO–GEO–COS visual series comprising biological, geological and cosmic forms. These series are particularly significant to the study because they make it possible to present the hypothesis not only in abstract form, but also through specific visual material. The biological level will be represented by flowers, buds, leaves, succulents, seed structures, branching and organic networks. The geological level will be represented by stones, folded relief, valleys, mountain structures, underwater relief, faults and layered rocks. The cosmic level will be represented by nebulae, galaxies, stellar clouds, envelopes and spiral structures.

The analysis of visual series must be based not on a subjective impression of resemblance, but on predetermined features. For each image, it is necessary to record the presence of a centre, axis, layering, branching, radiality and spirality, together with the character of the edge, the degree of unfolding and the possible stage of development. The visual material will then become not an embellishment of the study, but a research instrument. Comparative pairs and triads will be particularly important: flower — relief — nebula; leaf — valley — cosmic envelope; bud — stone — planetary or gas-and-dust structure. Such triads will demonstrate how a single morphological principle may manifest itself at different scales.

The fifth task is to examine artefacts, the World Tree, Sumerian bas-reliefs, sacred geometries and crop circles as cultural records of morphogenetic schemes. This section requires particular caution. Cultural images cannot be treated in the same way as biological or geological objects. They possess historical, religious, symbolic, artistic and social contexts. This does not, however, exclude their morphological analysis. Ancient cultures observed nature, the sky, plants, animals, water, mountains, stars and the cycles of life. These observations may have been recorded in symbols, ornaments, bas-reliefs, architecture and sacred geometry.

Within the study, cultural-symbolic forms will be regarded as a distinctive layer of visual memory. The image of the World Tree makes it possible to analyse the axis, root, trunk, branching, hierarchy of levels and the relationship between the hidden and the manifest. Sumerian bas-reliefs may be read as schemes of the seed, axis, unfolding, stellate form and reproduction. The Shri Yantra, mandalas, rosettes and lotus display a centre, nested organisation, multilayered structure and movement from a point towards a complex structure. Crop circles may be considered processual diagrams comprising a centre, rotation, layers, petals, edges and stages of unfolding. The book will emphasise, however, that cultural interpretation does not replace archaeological, historical or religion-historical attribution, but supplements it with a morphological reading.

The sixth task is to develop a methodology for the possible verification of the hypothesis. This is one of the most important sections of the study. The hypothesis cannot remain merely an attractive system of images. If it is to be considered seriously in scientific terms, it is necessary to demonstrate which of its propositions can be tested and how. Not all assertions may be testable; the testable ones will primarily concern the recurrence of morphological features, fractal dimension, symmetry, the character of branching, edge structure, layering, radiality and the staged development of form.

The verification methodology may include morphometric analysis, fractal analysis, digital image processing, the classification of visual series, the construction of BIO–GEO–COS databases, computer recognition of structural features, numerical modelling of reaction-diffusion processes, L-systems, models of growth and unfolding, and statistical comparison of independent samples. It is particularly important to move beyond the manual selection of only those images that support the hypothesis. Rigorous testing requires independent datasets and predetermined analytical criteria.

The seventh task is to determine the limits of the hypothesis's applicability and distinguish scientifically testable propositions from philosophical-symbolic interpretations. This is a necessary condition of the study's scientific integrity. The hypothesis of the Unified Matrix of the Universe comprises several levels:

- the first level is that of the natural sciences: models of self-organisation, morphogenesis, fractality, symmetry, growth and structural stability;

- the second level is comparative-morphological: the comparison of forms from different systems according to a set of features;
- the third level is philosophical: the interpretation of form, wholeness, potentiality, unfolding and universality;
- the fourth level is symbolic-cultural: the interpretation of artefacts, bas-reliefs, sacred geometry and visual traditions.

If these levels are conflated, the hypothesis will become vulnerable. If they are distinguished and connected in a methodologically sound manner, it will acquire internal stability. Scientifically testable propositions must be separated from those that remain philosophical assumptions or hermeneutic interpretations. The presence of a fractal structure in a series of natural objects, for example, can be tested. The recurrence of axial and radial forms can be measured and classified. The resemblance of a bas-relief to a morphogenetic scheme can be interpreted, but cannot be presented as experimental evidence. Such a hierarchy of levels will preserve both the scientific rigour and the philosophical depth of the study.

All the tasks listed above are subordinated to the overall logic of the study. It is first necessary to construct the theoretical foundation, then formulate the hypothesis, and subsequently proceed to the analysis of natural, cosmic and cultural forms. Finally, the methods of verification and the limits of applicability must be established. This sequence makes it possible to avoid the chaotic accumulation of analogies. The book must proceed from concept to material and from material to a testable research programme.

Completing these tasks will make it possible to present the hypothesis of the Unified Matrix of the Universe as an integrated scientific and philosophical concept. Its strength will lie not in providing immediate and definitive answers, but in formulating a new level of questions: how form recurs in nature; why different systems arrive at similar structural solutions; where the boundary lies between analogy and invariant; whether a general morphological theory of self-organisation can be created; and how the scientific description of form can be combined with a philosophical understanding of the wholeness of the world.

6. Methodological Principle

The methodological principle is based on a strict separation between levels of evidence. This is necessary not only for the internal logic of the study, but also for its scientific defensibility. The hypothesis of the Unified Matrix of the Universe works with material of different kinds: scientific theories, natural forms, cosmic structures, visual comparisons, ancient artefacts and philosophical categories. If all these materials are merged into a single sequence, the hypothesis will lose its methodological stability. A flower, stone, nebula, Sumerian bas-relief and sacred geometry would then be presented as equivalent forms of evidence, even though their scientific status differs. From the outset, the book must therefore distinguish between a theoretically substantiated model, a comparative-morphological observation and a philosophical or hermeneutic interpretation.

This distinction does not weaken the hypothesis; on the contrary, it makes it more rigorous. Scientific work with interdisciplinary material requires not only breadth of vision, but also a disciplined separation between levels. The broader the scope of a hypothesis, the clearer its internal boundaries must be. Otherwise, the study may easily become either a collection of

attractive analogies or a speculative construction that cannot be tested. The hypothesis of the Unified Matrix of the Universe must develop differently: as a concept in which different types of material occupy their appropriate places and perform different functions.

The book distinguishes three principal levels of evidence: scientific-theoretical, morphological-comparative and philosophical-hermeneutic. They are neither opposed to one another nor conflated. The first level provides the scientific foundation. The second makes it possible to work with visual and morphological material. The third reveals the semantic, cultural and philosophical horizons of the hypothesis. Together, they constitute an integrated methodological structure, but each requires its own language and its own degree of caution.

The first level is scientific-theoretical. It encompasses models and fields that already possess recognised status in modern science: A. Turing's reaction-diffusion model of morphogenesis, fractal geometry, the synergetics of non-equilibrium systems, complex systems theory, the biomechanical concept of tensegrity, holistic approaches to morphogenesis and the principle of biological relativity. This is the most rigorous level, since it rests upon established scientific concepts, mathematical models, experimental data and research traditions.

The Turing reaction-diffusion model is important to the hypothesis because it demonstrates the fundamental possibility that ordered spatial structures may arise from an initially homogeneous state. The interaction of an activator and an inhibitor, different rates of diffusion, local activation and long-range inhibition create the conditions for the emergence of spots, stripes, spirals and other patterns. For the hypothesis of the Unified Matrix of the Universe, this does not constitute direct evidence of a universal law; it is, however, an important theoretical example of how form may arise from the internal dynamics of a system rather than from an externally imposed blueprint.

Fractal geometry provides another fundamental language. It makes it possible to describe natural structures that cannot be accommodated within the simple geometry of smooth lines and regular figures. A leaf, fern, vascular network, coastline, mountainous relief, cloud, branching lightning bolt or structure of cosmic matter may be examined through the concepts of self-similarity, scale invariance and fractal dimension. This is particularly important to the hypothesis: the recurrence of form must not only be observed visually but, wherever possible, measured.

Synergetics and complex systems theory make it possible to describe form as the result of non-linear processes. They demonstrate that order arises not only in stable states of equilibrium, but also under conditions of stress, exchange, fluctuation and transition. A natural structure frequently appears precisely when a system departs from simple equilibrium and begins to seek a new form of stability. In this sense, morphogenesis may be understood as a process of transition: from a potential state to a manifest one, from symmetry to asymmetry and from homogeneity to articulated form.

The concept of tensegrity and holistic approaches in biology make it possible to regard form not only as the result of a genetic programme or chemical reactions, but also as the outcome of interactions between mechanical stresses, compression, tension, connections, boundaries and spatial architecture. A living form is not maintained by a single level of causation. Molecular, cellular, tissue-level, mechanical, electrical and geometric factors all operate within it. The principle of biological relativity supplements this picture: no single level can be proclaimed the sole source of causation. Influences proceed both from the bottom upwards and from the top downwards, from the parts to the whole and from the whole to the parts.

The scientific-theoretical level enables the hypothesis to avoid arbitrariness. It demonstrates that the principal themes of the study — self-organisation, morphogenesis, self-similarity, wholeness, levels, fields, stresses, symmetry and symmetry breaking — are already present in contemporary scientific thought. The hypothesis of the Unified Matrix of the Universe must not set itself in opposition to these fields. Its task is to attempt to bring them together within a broader meta-theoretical framework in which different scientific models are regarded as particular ways of describing a general process of form generation.

The second level is morphological-comparative. It concerns the analysis of visual analogies and structural similarities between flowers, leaves, seeds, stones, mountainous relief, underwater forms, nebulae, galaxies and other natural objects. This level is less rigorous than the scientific-theoretical level, but it is exceptionally important to the hypothesis itself. It is here that the principal empirical impetus of the study arises: the observation of recurrent forms at different scales and in different environments.

The morphological-comparative level requires particular care. It cannot be claimed that a flower and a nebula have the same mechanism of origin. It cannot be said that a stone ‘grows’ in the same sense as a plant. A geological fold cannot be identified with a petal, nor a galactic spiral with a rose. It is nevertheless possible to analyse which structural features recur within them: the centre, axis, radiality, layering, spirality, scalloped edge, branching, self-similarity and the transition from a dense core to an unfolded periphery.

The distinction between ‘resemblance’ and ‘invariant’ is crucial at the second level. Resemblance may be accidental, subjective, aesthetic or produced by characteristics of human perception. An invariant, by contrast, must be described as a recurrent structural feature that can be identified, classified and, wherever possible, measured. The discovery of centred organisation in different objects, for example, does not in itself demonstrate that they have a common origin. If radiality, layering, an active edge and staged unfolding recur alongside the centre, however, the material becomes more substantial for comparative analysis.

Visual series are required for work at this level. BIO–GEO–COS series, in which biological, geological and cosmic forms are compared, are particularly important. Such a series may include, for example, a flower, folded relief and a nebula; a leaf, river or mountain system and cosmic envelope; a bud, stone structure and gas-and-dust formation; or a succulent, underwater relief and spiral cosmic form. Each image must be regarded not as an illustration of a predetermined conclusion, but as material for the analysis of features.

The morphological-comparative level must be organised through a register of features. For each object, it is necessary to record the presence of a centre, the type of axis, the degree of symmetry, the character of asymmetry, layering, branching, radiality, spirality, edge complexity, the presence of recurrent modules and the possible stage of unfolding. This approach makes it possible to move gradually from visual intuition to an analytical table. It may subsequently provide a basis for morphometrics, fractal analysis, computer recognition of form and statistical testing.

It is important to emphasise that, at this level, images do not constitute evidence in the strict experimental sense. They are sources of observation and material for formulating the question. Their function is to identify recurrent morphological features, demonstrate the range of their manifestations and prepare the ground for further analysis. Visual persuasiveness may be powerful, but it must be translated into the language of scientific procedure. Only then does the

comparative material cease to be a subjective selection and become part of a research programme.

The third level is philosophical-hermeneutic. It concerns the interpretation of artefacts, ancient symbols, the image of the World Tree, Sumerian bas-reliefs, sacred geometry, the Shri Yantra, the lotus, crop circles and other cultural forms. This is the most complex level, since it addresses not only natural structures, but also human meaning, symbols, tradition and visual memory. Here it is particularly important not to replace historical research with unrestricted speculation.

The philosophical-hermeneutic level must not claim that ancient cultures possessed, in the modern scientific sense, a theory of morphogenesis, fractal geometry or the physics of complex systems. Such a claim would be incorrect. A different question may nevertheless be posed: why do images of the centre, axis, tree, seed, star, opening flower, circle, nested geometry, spiral, radial structure and multilevel cosmos persistently appear in different cultures? These images may record not a scientific theory, but the observable universality of forms interpreted through symbolic thought.

In this context, the World Tree may be regarded as a cultural model of the vertical axis, growth, branching and the connection between levels. The root, trunk, branches, crown, fruit and seed constitute not only a mythological scheme of the world, but also a morphological model of the transition from a hidden foundation to a branching, manifest structure. Sumerian bas-reliefs may be read as visual compositions in which the circle, staff, crescent, star, water, plant and seed form a possible scheme of the unfolding and reproduction of form. Sacred geometries display the centre, nested organisation, symmetry, repetition and movement from the simple to the complex. Crop circles, irrespective of the question of their origin, may be considered planar diagrams of layering, radiality, rotation and unfolding.

This level is necessary to the book because the hypothesis of the Unified Matrix of the Universe is not only scientific, but also philosophical. It raises the question of why human consciousness repeatedly returns to the same morphological images in different historical periods. If nature genuinely displays recurrent structural principles, culture may be one means of recording them. In this case, the symbol does not replace scientific explanation, but demonstrates that form possesses not only a physical dimension but also a dimension of meaning.

The philosophical-hermeneutic level must nevertheless be separated from the scientific-theoretical level. Interpreting a Sumerian bas-relief as a model of the unfolding of a grain does not constitute experimental evidence for the hypothesis. Analysing the World Tree as a morphogenetic scheme does not prove a universal law of nature. Considering the Shri Yantra or crop circles as structures of unfolding does not automatically confirm the existence of a unified physical Matrix. All these forms may, however, constitute significant material for the philosophy of form and the comparative morphology of culture. Evidence here has a different character: it is not experimental, but interpretative, semantic and structural-hermeneutic.

The three levels of evidence therefore differ in status. The scientific-theoretical level rests upon recognised models and may be associated with experiment, mathematics and verification. The morphological-comparative level works with visual features and requires classification, measurement and statistical testing. The philosophical-hermeneutic level reveals structures of meaning and cultural forms, but requires particular caution and cannot substitute for scientific evidence.

The strength of the study will depend on how consistently this distinction is maintained. If the text discusses the Turing model, fractality or self-organisation, it is operating at the scientific-theoretical level. If a flower, relief and nebula are compared, it is operating at the morphological-comparative level. If the World Tree, a Sumerian bas-relief or sacred geometry is analysed, it is operating at the philosophical-hermeneutic level. In every case, it is necessary to understand the level at which a claim is being made and the degree of evidential support it possesses.

This approach makes it possible to avoid the principal methodological error of turning the hypothesis into a universal explanation of everything. The present book must not claim that all forms in the Universe literally originate from one and the same scheme in a physical sense. It must investigate a more nuanced question: whether recurrent morphogenetic principles manifest themselves in different systems and whether they can be described in the form of a unified meta-theoretical model. Answering this question requires not a slogan, but systematic analysis.

Separating the levels of evidence also preserves the openness of the hypothesis. The scientific-theoretical level may develop through the refinement of models and the incorporation of new data. The morphological-comparative level may be strengthened by creating an atlas of images, a feature classifier, morphometric procedures and computer analysis. The philosophical-hermeneutic level may be expanded through a deeper study of symbolic systems, cultural history, archetypes of form and modes of visual thought. All three levels may develop in parallel without erasing the distinctions between them.

An important consequence of this approach Is the possibility of further testing the hypothesis. The propositions that should be tested first are those concerning recurrent structural features. The fractal dimensions of leaves, landforms and cosmic clouds can be analysed. Types of branching in biological and geological systems can be compared. Contours, degrees of symmetry, the character of edges, the distribution of layers, and parameters of radiality and spirality can be measured. Image databases can be created to determine whether the identified invariants genuinely occur more frequently than might be expected by chance. Such a programme of verification is impossible without a clear distinction between what can be measured and what can be interpreted.

At the same time, the philosophical level must not disappear from the study. Science answers questions about mechanisms, but the problem of form is broader than the problem of mechanism. Form is connected with wholeness, direction, becoming, the memory of a process, the relationship between part and whole, the hidden and the manifest, and the centre and periphery. These questions cannot be reduced entirely to measurement. They require a philosophical language. The book must therefore maintain a balance: it must be sufficiently rigorous for scientific discussion and sufficiently broad for philosophical reflection.

The methodological principle of the study may be expressed as follows: the hypothesis of the Unified Matrix of the Universe must be regarded as a multilevel research construct in which scientific models, morphological comparisons and philosophical interpretations are connected but do not substitute for one another. The scientific level provides the foundation; the comparative level reveals the material; and the philosophical level supplies depth of meaning. Only through such a distribution can the hypothesis be presented seriously, without oversimplification or mystification.

It is this distinction that will determine the subsequent structure of the study. The following chapters will first examine the scientific and philosophical foundations of the problem of form,

followed by models of self-organisation, morphogenesis and fractality. The hypothesis of the Unified Matrix of the Universe and its principal structural elements will then be formulated. Biological, geological, cosmic and cultural-symbolic materials will subsequently be analysed. Finally, a methodology of verification will be proposed, the limitations of the hypothesis identified and the prospects for its further development defined.

The introduction therefore establishes not only the subject of the study, but also its rules. The principal task is not to prove a predetermined conclusion at any cost, but to construct a disciplined path from the observation that forms recur to a possible morphological theory. The hypothesis of the Unified Matrix of the Universe will be considered an attempt to understand why nature, matter, life, the cosmos and culture so frequently return to the same structural motifs: the centre, axis, layer, branch, spiral, circle, unfolding and self-similarity. The scientific value of the study will be determined by the consistency with which these motifs can be described, distinguished, compared and prepared for further testing.

For this reason, the book begins not with an assertion, but with a question. Is there a common morphogenetic order manifested in the diversity of forms? Is it possible to speak of the Matrix as a structural logic of self-organisation without turning it into a mystical entity? Where does the boundary lie between analogy, invariant and evidence? How can natural form simultaneously be an object of science, a subject of philosophy and a source of cultural symbolism? The answers to these questions constitute the subject matter of the present monograph.

Part One

Theoretical and Philosophical Foundations of the Hypothesis

Chapter One.

The Problem of Form in the History of Scientific and Philosophical Knowledge

1.1. Form as a Philosophical Category

The concept of form belongs to the class of categories without which it is impossible to speak of nature, matter, development or knowledge. At first glance, form appears self-evident: it is the outward appearance of an object, its outline, contour, figure or visible boundary. We speak of the form of a leaf, stone, flower, cloud or galaxy, referring primarily to what can be seen, distinguished by the eye and differentiated from the surrounding space. This understanding, however, represents only the most superficial level. In philosophical and scientific terms, form is considerably more profound than an external contour. It expresses the mode of organisation of matter, the internal coherence of its parts, the character of their connections, the direction of development and the degree of wholeness of a system.

If form is regarded solely as an envelope, it becomes something secondary and almost accidental. Matter would then appear to exist independently, while form merely covers it from outside like a surface pattern or decorative layer. Nature, however, is organised differently. Form does not merely delimit an object externally; it reveals how the object is assembled internally. Form manifests the distribution of elements, the connections between them, the position of the centre, the course of the axis, the organisation of boundaries, the manner in which parts are held together within a whole and the way in which the system interacts with its environment.

For this reason, form cannot be understood as a passive outcome. It is an expression of order. In a leaf, form reveals the direction of growth, the position of the central vein, the distribution of lateral branches, the character of the edge and the relationship between surface area and the function of exchange. In a flower, form reveals the relationship between the centre and the petals, radial organisation, the stages of opening and the connection between the protective envelope of the bud and the open structure of the flower. In a stone, form records a history of pressure, layering, crystallisation, destruction, internal stress and time. In a nebula, form indicates the dynamics of gas, radiation, expansion, gravity and the interaction of matter. Even where form appears chaotic, it frequently retains a trace of the process that produced it.

Form, therefore, is not an external embellishment of matter, but a mode of its existence. Matter is presented to us not as a formless mass, but as an organised reality. Everything that exists does so in some form: as a body, field, flow, structure, system, event, network, layer, rhythm or configuration. Even processes that are difficult to imagine as stable objects possess form: a vortex, wave, flame, cloud, current, growth, decay, explosion or crystallisation. Their form may be short-lived, mutable and mobile, but it is precisely this form that makes the process distinguishable and determinate.

In this sense, form is one of the principal means through which matter becomes knowable. We recognise an object not only by its composition, but also by its organisation. Two objects may

consist of similar substances while possessing entirely different forms and, consequently, different properties. Carbon in different structural states may produce substances with different characteristics. The same chemical elements may be incorporated into fundamentally different systems of connections in a living organism and a non-living environment. Material alone does not explain the wholeness of an object. It is also necessary to understand how that material is organised.

The philosophical significance of form lies precisely in this: form connects substance with order. It demonstrates that matter is not an abstract indeterminacy. Matter is always formed, that is, incorporated into a particular structure. At the same time, form cannot be reduced to geometry in the narrow sense. Geometry describes a crucial aspect of form, but form is broader than a geometric figure. It includes function, dynamics, internal connections, the history of its emergence and the capacity for change and reproduction. The form of a flower is not merely the number and arrangement of its petals. It also encompasses the manner in which it opens, its relationship to light and pollination, its relationship to the seed and its place within the plant's life cycle. The form of a river network is not merely a pattern of lines on a map. It expresses relief, drainage, erosion, climate, time and the resistance of the surface.

Form is therefore always connected with structure. Structure is the order governing the relative arrangement and interconnection of elements. Form makes structure visible or, at the very least, accessible to analysis. Where we see branching, we infer the distribution of a flow or growth from the centre towards the periphery. Where we see layering, we infer a sequence of accumulation, pressure, growth or unfolding. Where we see a spiral, we infer motion, rotation, displacement and repetition as the scale changes. Where we see radiality, we infer a centre and propagation from it. Form is the external manifestation of a structural principle.

Form is connected not only with structure, but also with function. In living nature, this relationship is particularly evident. The form of a wing is associated with flight; the form of a leaf, with photosynthesis and transpiration; the form of a vascular network, with the distribution of substances; the form of the lungs, with an increase in the surface area available for gas exchange; and the form of the eye, with the perception of light. Yet even in non-living nature, form is not indifferent to function, provided that function is understood more broadly as the role of a structure within a system of processes. The form of a river channel is connected with the movement of water. The form of a crystal is connected with the internal order of its lattice. The form of a mountain fold is connected with the distribution of stresses. The form of a nebula is connected with the dynamics of the cosmic environment. Even if function is not understood in the biological sense, form still expresses the operation of particular forces and conditions.

This has direct significance for the hypothesis of the Unified Matrix of the Universe. If form is a mode of organising matter, the recurrence of forms at different levels cannot be declared accidental or purely aesthetic in advance. It requires analysis. When the centre, axis, spiral, branching, layering, radiality or fractality recur in different systems, this may indicate not a literal identity between objects, but a similarity in their modes of organisation. In that case, the subject of the study becomes not outward resemblance but a structural logic that may manifest itself in different physical, biological, geological or cultural environments.

Form is also connected with the direction of development. It not only records what an object is at a particular moment, but also retains a trace of how it became what it is. Form contains the memory of a process. The annual rings of a tree reveal the passage of growth. Folds in rock preserve a history of pressure. Lines in a leaf reveal the directions of flows and growth. A spiral

shell records the successive accumulation of material. The envelope of a nebula may preserve a trace of expansion. A cultural ornament may record the observation of a recurrent natural motif. Form must therefore not be regarded as an immobile mask worn by an object. It is a process that has become fixed or remains ongoing.

In this respect, it is particularly important to distinguish between static and processual form. A static understanding regards form as a completed figure. A processual understanding treats form as a phase of becoming. The second understanding is fundamental to the hypothesis of the Unified Matrix of the Universe. Here, form does not merely exist; it unfolds. A seed becomes a shoot, the shoot a stem, the bud a flower, the flower a fruit and the fruit a new seed. A stone structure records stages of internal stress, layer separation, surface exposure and stabilisation. A cosmic form may be understood as a moment within a prolonged process of concentration, ejection, expansion, dispersion and renewed structuring of matter. Form is not merely an outcome, but also a trajectory.

The philosophical category of form makes it possible to retain this connection between outcome and process. It connects the visible with the invisible. Visible form reveals an invisible order: forces, connections, stresses, potentialities and a history of development. When we look at an open flower, we see not only its petals, but also the hidden preceding stage of the bud. When we see a mountain fold, we see not only the line of the relief, but also the prolonged operation of pressure. When we see the ancient symbol of a tree, we may perceive not only a mythological image, but also a cultural interpretation of growth, the axis, branching and the connection between levels. Form continually connects what is manifest with that which made its manifestation possible.

In classical philosophy, the category of form was frequently connected with the question of the essence of a thing. A thing is not merely a quantity of matter, but a particular organised whole. It is form that makes a thing this particular thing rather than another. For contemporary research, however, it is important not to reproduce old metaphysical schemes literally, but to extract their productive core: form genuinely indicates a principle of organisation. It makes it possible to understand why parts constitute a whole, why that whole remains stable, why development proceeds in a particular direction and why different systems may display similar structural solutions.

In the scientific knowledge of the twentieth and twenty-first centuries, this philosophical understanding of form acquired new foundations. Systems theory demonstrated that the whole possesses properties that cannot be reduced to its parts. Synergetics showed that order may emerge in non-equilibrium processes. Fractal geometry provided a language for describing self-similar structures. Developmental biology demonstrated that the form of an organism arises through interactions between genetic, chemical, mechanical, electrical and spatial factors. Geology and cosmology revealed that complex forms also arise in non-living matter. All this restores serious scientific significance to the concept of form.

At the same time, form must not be understood as a predetermined ideal blueprint that matter merely executes. Such an understanding would be excessively rigid. In real systems, form arises through the interaction between potential and conditions. A seed contains the possibility of a plant, but the plant's particular form depends on light, water, soil, space, damage and the surrounding environment. A mountain structure arises under the influence of tectonic forces, but its particular appearance depends on rock composition, climate, erosion and time. A nebula forms within a cosmic environment in which numerous factors interact non-linearly. Form is

therefore not the mechanical embodiment of a completed scheme, but the result of directed becoming under particular conditions.

This understanding is especially important to the scientific caution required by the hypothesis of the Unified Matrix of the Universe. If the Matrix is described as a structural logic of form generation, it cannot be presented as an unchanging template imprinted identically upon every object. It should instead be understood as a set of universal principles realised differently in different environments. The centre, axis, layer, branching, spiral, radiality, edge and self-similarity may manifest themselves in biology, geology, cosmology and culture, but in every instance they are incorporated into a specific process and specific material. Universality does not abolish difference here; it manifests itself through difference.

Form is also connected with the boundary. Without a boundary, an object cannot be distinguished from its environment. Yet a boundary is not merely a line of separation. It is a zone of interaction. In living systems, a boundary separates the organism from the external environment while simultaneously permitting exchange. The edge of a leaf or petal not only completes the form, but also reveals the character of its growth. A coastline not only separates land from water, but also records their continuous interaction. The contour of a cloud or nebula is a transition zone between higher and lower density, between structure and dispersion. In philosophical terms, a boundary shows that form does not exist in isolation, but in relation to its surroundings.

It follows that form always contains a tension between the internal and the external. The internal tends towards organisation, while the external establishes conditions, limitations and resistance. Form arises through their interaction. It belongs neither solely to the object nor solely to its environment. It lies between them, expressing the mode of their connection. This is why the same system may produce different forms under different conditions, while different systems operating under similar organisational conditions may arrive at similar structural solutions.

Form is also connected with scale. The same structural principle may appear differently depending on the scale of observation. What seems to be a smooth contour at one level becomes a complex network at another. A leaf as a whole possesses one form, its veins another and its cells a third. Viewed from above, a mountain massif appears to be a large integrated structure, but at close range it breaks down into numerous folds, cracks and layers. In a telescopic image, a nebula displays a cloud-like wholeness, but physically consists of distributions of gas, dust, radiation and local inhomogeneities. Form therefore requires analysis across scales. Without it, self-similarity and fractality cannot be understood.

Fractality in this context is not a specialised mathematical embellishment, but a means of understanding form philosophically. It demonstrates that form may repeat its principle at different levels. This is particularly important to the idea of morphogenetic invariants. If a structure retains a particular logic in the transition from part to whole and from whole to part, form ceases to be an accidental surface. It becomes the expression of a deeper mode of organisation. In the hypothesis of the Unified Matrix of the Universe, fractality is regarded as one of the languages that make it possible to discuss the recurrence of form without directly identifying different objects with one another.

Another important aspect of form is its capacity to combine order and variability. Form is never entirely arbitrary, but it is rarely completely identical. Two leaves on the same plant resemble one another, but are not identical. Two mountain folds may share the same underlying principle while displaying different patterns. Two nebulae may exhibit similar radiality or envelope-like

organisation while differing in structure. The symbol of the tree retains its axis and branching in different cultures, but acquires different artistic expressions. Form therefore exists as a stable principle that admits numerous variations. It is precisely this that makes it a useful category for interdisciplinary analysis.

For the hypothesis of the Unified Matrix of the Universe, this means that the proposed universal morphogenetic order must not be understood as uniformity. On the contrary, it manifests itself through diversity. If all forms were identical, there would be no development. If they were wholly incommensurable, it would be impossible to speak of invariants. Reality lies between these poles: forms differ, yet common structural principles may recur within their differences. The task of the study is to identify these principles without erasing the distinctions between objects.

Form also provides a connecting concept between the natural sciences and the humanities. In the natural sciences, form is analysed as the structure of matter, the result of processes, the geometry of growth, and the distribution of matter and energy. In the humanities, form is regarded as image, symbol, composition, cultural scheme and a means of expressing meaning. These approaches are usually separated. In reality, however, they meet precisely in the problem of form. Human beings perceive natural forms, interpret them and transfer them into symbols, architecture, ornaments, mythological images and scientific models. Form is therefore simultaneously natural and culturally significant.

This is particularly important to the subsequent analysis of artefacts, the World Tree, Sumerian bas-reliefs, sacred geometry and crop circles. These materials cannot be treated as scientific facts of the same kind as biological or geological structures. Nor, however, can they be excluded entirely from the study of form. They demonstrate how human consciousness recorded stable images of the centre, axis, tree, seed, star, circle, unfolding, layering and cosmic order. In this sense, cultural form may be understood as a semantic reflection of an observed morphological regularity.

Form as a philosophical category therefore opens the possibility of a distinctive type of research. It makes it possible to speak not only of the composition of objects, but also of their organisation; not only of an external contour, but also of an internal order; not only of a static appearance, but also of a process of becoming; and not only of the differences between sciences, but also of the possible connections between them. Through form, it is possible to compare the living and the non-living, the terrestrial and the cosmic, and the natural and the cultural without reducing one to another.

Within the hypothesis of the Unified Matrix of the Universe, form is the foundational category. Without its philosophical clarification, the hypothesis itself would risk being understood too narrowly as a claim concerning the external resemblance of different objects. The actual problem is more profound: can universal modes of organising matter exist and manifest themselves through recurrent morphological invariants? To pose this question scientifically, form must be understood not as surface but as structure; not as decoration but as order; and not as an immobile figure but as the trace and direction of a process.

It is in this sense that form becomes the key to the subsequent study. It connects matter with organisation, structure with function, development with memory, centre with periphery, part with whole, and nature with culture. If the hypothesis of the Unified Matrix of the Universe possesses scientific and philosophical potential, it begins precisely here: with the recognition of form not as a secondary attribute of a thing, but as a fundamental mode through which order manifests itself in matter.

1.2. Form, Matter and Becoming

The relationship between form and matter is one of the central problems of philosophy. It arises whenever we attempt to understand what makes a thing what it is. Is it sufficient to state what substance an object consists of? Or must we also explain how that substance is organised? Why does the same material acquire different properties when incorporated into different structures? Why is matter never presented to us as an indeterminate mass, but always in the form of bodies, processes, fields, layers, flows, networks, organisms, crystals, landforms, clouds and symbolic images?

At first glance, matter appears primary and form secondary. It might be assumed that substance exists first and subsequently receives form, as clay acquires the outlines of a vessel. Such a conception, however, oversimplifies reality. In nature, matter is never given outside some form of organisation. Even that which appears formless possesses a particular state: density, distribution, direction of movement, boundaries, internal stresses and an energetic regime. A cloud of gas, a flow of water, molten rock, plasma, dust and a mass of cells are not devoid of form; rather, they possess mobile, transitional, unstable or developing forms.

Form must therefore not be understood as an external addition to matter. It is the means through which matter becomes determinate. Matter without form could not be distinguished, described or known. Form renders matter structured and therefore accessible to analysis. Through form, we see how substance is distributed and maintained, how it interacts with the external environment, the direction in which it changes and the possibilities for further development that it contains.

This is particularly important to the hypothesis of the Unified Matrix of the Universe, in which form is regarded not as an accidental outward appearance, but as a manifestation of a system's internal potential. Potential must be understood here not mystically, but structurally. Every system possesses a particular range of possibilities determined by its composition, environmental conditions, internal connections, energetic state, boundaries and dynamics. Form arises when this potential begins to manifest itself in the organisation of matter. It is not simply 'imposed' upon substance, but reveals how substance is capable of becoming a structure.

A plant seed is one of the clearest examples of this relationship between form, matter and becoming. The future possibility of the plant is already present within the seed, but it is not yet a developed plant. The seed does not contain a ready-made miniature copy of a tree or flower that merely needs to be enlarged. It contains a programme, a potentiality, a direction of development and a system of possibilities. For this potentiality to become an actual form, a process is required: interaction with water, soil, light, temperature and time, as well as with internal biochemical mechanisms and external conditions. The form of the plant arises through becoming, as the gradual unfolding of a hidden order.

In this sense, the seed is important not only as a biological object, but also as a philosophical model. It shows that form may exist potentially before it manifests itself externally. The future stem, leaf, flower or fruit is not yet visible, but its possibility is already contained within the system. When growth begins, this possibility does not simply emerge externally; it passes through successive transformations. The hidden becomes manifest, not instantaneously but through a

sequence of states. This logic — potentiality, unfolding, differentiation, stabilisation and renewed reproduction — lies at the foundation of the hypothesis of the Unified Matrix of the Universe.

It would, however, be mistaken to restrict this principle to living nature. Transitions from potential to form may also be observed in non-living matter, although they have a different nature and operate on different timescales. A crystal arises not as an arbitrary figure, but as a manifestation of the internal order of a substance. Its form is connected with the arrangement of atoms, conditions of growth, temperature, pressure, rate of crystallisation and surrounding environment. A mountain fold arises through tectonic stresses, rock composition, pressure, time and deformation. A stone may preserve lines, layers, waves, ruptures and patterns that record processes which once occurred within the material. A cosmic nebula acquires form through interactions between gas, dust, radiation, gravity, shock waves and expansion. In all these cases, form is not an embellishment of matter, but a mode of its becoming.

Becoming is a key concept for understanding form. If form is conceived only as a completed state, we see only the outcome. Real form, however, always has a history. It arose from something, passed through particular stages and may enter another state. Even a stable object retains traces of becoming within itself. The annual rings of a tree reveal the rhythm of time. Layers of rock indicate a sequence of accumulation and pressure. The contour of a river valley records the prolonged interaction between water and relief. A spiral shell demonstrates the successive accumulation of material. A flower bears the memory of the bud. A fruit bears the memory of the flower and the possibility of a new seed.

Form therefore cannot be fully understood outside time. Geometric description is necessary, but insufficient. It answers the question of how a form is organised at present. The hypothesis of the Unified Matrix of the Universe also requires us to ask: how did this form become possible? From what state did it emerge? Through which stages did it pass? What has it retained from the preceding stage? What new potential does it contain? Under this formulation, form is transformed from a static object into an event in the organisation of matter.

The classical philosophical problem of form and matter is given a contemporary continuation here. Matter does not exist outside form, because every mode of existence already entails a particular organisation. Yet form does not exist separately from matter as an independent shadow or abstract scheme. It is realised only in a material substrate: in plant tissue, the structure of a mineral, the movement of water, the distribution of gas, a crystal lattice, the architecture of an organism or the image of an artefact. Form and matter are inseparable, but they are not identical. Matter provides possibility; form provides determinacy. Matter carries potential; form manifests that potential in structure.

This understanding makes it possible to avoid two extremes. The first is crude materialism, in which form is regarded as secondary and almost insignificant. Here, everything is explained solely through the composition of substance or a collection of elements. The question of wholeness then disappears: why do the elements form this particular system, why does it possess this particular stability, why are its parts arranged in this particular way, and why does it develop in a particular direction? The second extreme is abstract idealism, in which form becomes an independent entity ostensibly separate from matter. This severs the connection with real processes, conditions, physical mechanisms and empirical testing. The hypothesis of the Unified Matrix of the Universe must maintain an intermediate position: form is real as a mode of organising matter, but it does not exist outside specific material processes.

The concept of a system's internal potential is particularly important within this hypothesis. Potential is not a completed form in miniature, but the possibility of a particular unfolding. It may be determined by genetic information, physical conditions, energetic state, environmental stress, the structure of a field, geometric constraints, chemical composition or a cultural code. Potential itself, however, is not yet manifest form. It must pass through a process of becoming. Only within this process does it become apparent how a hidden possibility is transformed into structure.

This gives rise to one of the central motifs of the hypothesis: form is not created instantaneously, but unfolds. Unfolding denotes the transition from an enfolded state to an organisation that is more open, articulated, multilayered and functionally determinate. A bud unfolds into a flower. A leaf unfolds its surface and network of veins. A tree unfolds into its trunk, branches, crown, leaves and fruit. A geological structure renders internal stresses manifest through folds, layers, faults and relief. The cosmic environment unfolds concentrations of matter into nebulae, envelopes, spirals and stellar structures. A cultural symbol unfolds an observed natural regularity into an image, sign or ornament.

Unfolding must not be understood too literally. It occurs differently in different systems. In biology, it is associated with the growth and development of an organism. In geology, with prolonged processes of pressure, destruction, accumulation and deformation. In the cosmos, with the movement of matter, gravity, radiation and expansion. In culture, with the symbolic interpretation and recording of form. At the morphological level, however, all these cases involve a transition from a less manifest structure to a more manifest one, from the hidden to the revealed, from the compact to the articulated, and from the potential to the actual.

This introduces the important category of actualisation. A potential form becomes actual when it is expressed in a particular structure. Before the bud opens, it contains the future flower in hidden form, but the flower itself is not yet actual. Before crystallisation, a substance may possess the possibility of a particular structure, but the crystal has not yet formed. Before tectonic deformation, rocks may contain the possibility of folding, but the fold has not yet become manifest. Before a cultural image is created, an observed natural form may exist in perceptual experience, but the symbol has not yet been produced. Actualisation is the moment at which possibility becomes visible, organised and active.

Within the hypothesis of the Unified Matrix of the Universe, this logic is expressed through the model of the 'circle-seed' and its subsequent unfolding. The circle-seed denotes an initial state of wholeness, concentration and potentiality. It is closed, but not empty. Its closedness signifies not the absence of development, but concealed plenitude. Form has not yet been articulated within it, but the possibility of articulation is already present. Subsequent unfolding transforms this potential wholeness into a structure of layers, axes, branches, edges and recurrent modules. Form thus proceeds from internal integration to external manifestation.

This model has philosophical significance. It makes it possible to conceive becoming not as the chaotic addition of parts, but as the unfolding of an internal order. Development cannot be reduced to an increase in size. It entails differentiation: the emergence of distinctions within a whole. A seed becomes not a larger seed, but a plant. A bud becomes not an enlarged bud, but a flower. A crystal does not merely expand; it forms facets. Relief does not merely rise; it acquires folds, escarpments, valleys and lines of stress. A cosmic cloud does not merely occupy more space; it forms regions of density, envelopes, ruptures and luminous zones. The development of form is a qualitative increase in complexity.

At the same time, the becoming of form is always associated with the disruption of an initial homogeneity. So long as a system remains entirely homogeneous, it possesses no manifest structure. For form to arise, differences must emerge: centre and periphery, internal and external regions, axis and lateral directions, layer and boundary, dense and rarefied, stable and mobile. Symmetry breaking does not destroy order; it creates the possibility of a more complex order. This constitutes one of the important philosophical paradoxes of form: to become rich and fully developed, form must depart from simple symmetry.

This transition is clearly visible in living systems. A radially symmetrical bud gradually opens and its symmetry becomes more complex. The petals move away from the centre, the edges curve and the internal elements become visible. The original closedness is disrupted, but it is precisely through this disruption that the flower emerges as a manifest form. A similar logic may be found in other systems:

- a crack disrupts the homogeneity of a stone, but reveals its internal structure;
- a rupture in a cloud envelope destroys the smoothness of its contour, but reveals the dynamics of expansion;
- branching disrupts the single line of the trunk, but creates a crown.

Form develops through difference.

It follows that the becoming of form cannot be understood as movement towards a perfectly regular figure. Natural form is rarely absolutely geometric. It contains deviations, irregularities, disruptions, asymmetries, displacements, scalloped edges, ruptures and variations. Yet it is precisely these features that make form alive in the broader sense — not necessarily biologically living, but rich in processual history. They reveal the operation of conditions, resistance, internal stresses and time. An ideal circle may be mathematically pure, but in nature a circle often becomes a spiral, rosette, envelope, vortex, crater, eye-like marking, seed capsule or galactic disc. Potential symmetry is transformed into a particular historical form.

An important consequence of this understanding is the rejection of form as an accidental embellishment of matter. An embellishment may be removed without changing the essence of an object. Form cannot be removed. If the form of a living organism is destroyed, the organism ceases to be itself. If the structure of a crystal changes, its properties change. If the form of a vascular network is disrupted, its distributional function is impaired. If the form of a channel changes, the movement of water changes. If the architecture of a tissue changes, cellular behaviour changes. Form is not added to essence; it participates in essence itself.

In scientific and philosophical terms, form is therefore a mode through which the possibilities of matter are realised. Matter contains numerous potential states, but a particular form selects and stabilises one of them. It makes possibility actual. Yet form never exhausts potential completely. A completed structure may become the beginning of a new process. A flower becomes a fruit, the fruit a seed and the seed a new plant. Disintegrated rock becomes sediment, the sediment a new stratum and the stratum part of a future structure. Cosmic matter released through stellar destruction may become incorporated into new stars and planets. Form completes one stage while opening another.

This cyclicity is of considerable importance to the hypothesis of the Unified Matrix of the Universe. If form is a manifestation of internal potential, a completed form is not a final stopping point. It may be enfolded once again within a new potential state. For this reason, the model ‘seed — unfolding — branching — reproduction — new seed’ is important not only to biology. It expresses

a general principle of transition between the actual and the potential. That which has become manifest may once again provide the foundation for a hidden future. Understood in this way, form does not merely arise and disappear, but participates in a cycle of becoming.

The relationship between form, matter and becoming also permits a different view of the problem of wholeness. A whole is not the mechanical sum of its parts. It arises when the parts are organised in a particular manner and subordinated to a unified structural order. Petals in themselves do not yet constitute a flower unless they are connected with a centre, axis, rhythm of arrangement and reproductive function. Layers of stone do not in themselves constitute a geological structure unless their relative positions and history of pressure and deformation are taken into account. Stellar matter alone does not explain the form of a nebula unless the dynamics of distribution and the interaction of forces are considered. Form is what transforms multiplicity into a whole.

In this respect, form is close to the concept of organisation. Organisation, however, refers primarily to the order of connections, whereas form refers to the manifestation of that order. Form may be described as the visible and structural dimension of organisation. It reveals how a whole maintains itself. This is precisely why the analysis of form can serve as a bridge between philosophy and science. Philosophy asks about wholeness, becoming and potential. Science investigates mechanisms, structures and processes. Form connects these levels because it is simultaneously observable, measurable and meaningful.

For the further development of the hypothesis, it is important to emphasise that form is not in itself evidence. The fact that two systems possess similar outlines does not mean that they are governed by the same law. If, however, the similarity concerns not only the external contour but also a structural scenario — the centre, axis, layers, unfolding, branching, active edge and self-similarity — then a subject for serious analysis emerges. The question shifts from ‘does it look similar?’ to ‘which principle of organisation recurs here?’. This is the transition from visual analogy to morphogenetic thought.

Thus, the classical problem of form and matter acquires a new significance within the hypothesis of the Unified Matrix of the Universe. Matter does not exist outside form, because every reality constitutes some mode of organisation. Form is not an accidental embellishment of matter, because it is through form that the structure, function, direction of development and internal possibility of a system become manifest. Becoming connects matter and form through time: the potential becomes actual, the hidden becomes manifest, the closed becomes unfolded, the simple becomes multilayered and unity becomes multiplicity.

In this sense, the hypothesis of the Unified Matrix of the Universe may be understood as an attempt to describe the universal dimension of the becoming of form. It proceeds from the assumption that recurrent modes of transition from potential to structure may be discovered in different systems — biological, geological, cosmic and cultural. These modes do not eliminate the differences between systems, but make it possible to speak of morphogenetic invariants. Form here becomes not an external attribute of an object, but a philosophical and scientific key to understanding how matter unfolds its possibilities through the process of becoming.

1.3. From Symbol to Model

The transition from symbol to model is one of the most important and, at the same time, most hazardous moments in the development of the hypothesis of the Unified Matrix of the Universe. On the one hand, ancient symbols frequently preserve stable images of form: the tree, circle, seed, flower, star, spiral, lotus, world axis, unfolding centre, radial radiance, branching and recurrent levels. These images appear in different cultures, artistic techniques, and religious and mythological contexts. On the other hand, no ancient symbol can automatically be proclaimed a scientific scheme. Symbol and model differ in nature, mode of existence and degree of evidential support.

A symbol arises In culture as a means of connecting the visible and the invisible, nature and meaning, experience and a conception of the order of the world. It need not be an exact scientific formula. Its task is different: to contain a complex meaning within a condensed image. A tree may be an image of life, lineage, the vertical order of the world, the connection between earth and heaven, cyclicity, fertility and growth. A circle may signify wholeness, eternity, celestial order, completeness, return and centred organisation. A seed may symbolise a beginning, potential and the hidden plenitude of a future form. A flower may signify unfolding, beauty, maturity and the transition from the closed to the manifest. A star may signify light, a completed radial form, celestial structure and a higher order. None of these meanings is scientific in the strict sense, but neither are they accidental: they arise from the experience of observing nature.

This leads to the first important point: a symbol must not be regarded as an arbitrary sign. Many enduring cultural symbols are connected with recurrent natural forms. Human beings observed how a plant emerges from a seed, how a bud opens into a flower, how a tree connects roots, trunk, branches and fruit, how celestial bodies move in circles, how water branches into channels, how lightning tears across the sky in a tree-like line, how a shell winds into a spiral and how a flower opens radially. These observations were not scientific in the modern sense, but they constituted attentive experience of form. Culture recorded this experience in images.

An ancient symbol may therefore be regarded as a cultural record of an observed natural regularity. This does not mean that the ancient craftsperson who created a bas-relief, ornament or sacred geometry employed the concepts of morphogenesis, fractality or self-organisation. Their thought may have been mythological, ritual, religious, cosmological or artistic. Yet the image they selected and repeated may have preserved the structure of a natural process. The symbol does not explain that process scientifically, but it may retain it in visual form.

This provides a basis for the transition from symbol to model. Such a transition must be undertaken cautiously. It cannot be argued that if an ancient symbol resembles a natural structure, it therefore proves the existence of the Unified Matrix. That would constitute a methodological error. A different claim can, however, be made: if different cultures repeatedly reproduce the same structural images — the centre, axis, tree, circle, seed, star, unfolding, branching and multilayered organisation — these images may be incorporated into a comparative analysis of morphological schemes. The symbol then becomes not evidence, but material for interpretation.

A model differs from a symbol in that—it must be analytically determinate. A symbol admits multiple meanings; a model requires structure. A symbol may unite religious, aesthetic, cosmological and psychological meanings, whereas a model must demonstrate which elements are essential, what relationships exist between them and which process it describes. As a

symbol, for example, the image of a tree may signify life, lineage, the world, fertility and a sacred vertical axis. As a morphogenetic model, however, the tree may be described through a centre of growth, a vertical axis, a root system, trunk, branching, a hierarchy of levels, the self-similarity of branches and the relationship between a hidden foundation and an open crown.

It is precisely this analytical transition that is required for the hypothesis of the Unified Matrix of the Universe. Ancient images must not be used as ready-made scientific arguments. They must be analysed. The morphological features of each symbol must be identified: whether it possesses a centre or an axis, whether it contains a transition from unity to multiplicity, whether it displays layers, branching, radiality, spirality, cyclicity, the recurrence of a smaller form within a larger one, a stage of unfolding or a relationship between beginning and completion. Only then can the symbol be compared with natural forms and incorporated into a general morphogenetic logic.

Consider the image of the tree. In mythology and religious symbolism, the World Tree frequently connects subterranean, terrestrial and celestial levels. If specific mythological interpretations are set aside and the form itself is examined, however, a stable morphological scheme becomes visible: a hidden root, vertical trunk, directed growth, lateral branching, an extensive crown, leaves, flowers or fruit, and subsequently a new seed. This scheme is at once biological, spatial and philosophically rich. The tree demonstrates how a single centre of growth develops into a multiple structure while preserving the internal connection between all its levels. Understood in this way, the tree may be regarded as one of the most ancient visual models of morphogenesis.

The image of the circle has a different character. It is associated with wholeness, closedness, repetition and the centre. In morphogenetic terms, the circle may be understood as a form of potential completeness. It is not unfolded, articulated or branched, but it contains the possibility of direction. A circle may be a seed, disc, egg, eye, grain, celestial body, centre of an ornament, or the initial point of a mandala or diagram. What matters is not only its geometric regularity, but also its structural meaning: the circle contains the internal until the moment of unfolding. In the hypothesis of the Unified Matrix of the Universe, therefore, the circle becomes not merely a symbol of perfection, but a model of the initial closed form.

The seed continues this logic while making it more processual. A circle may be a pure form of wholeness, whereas a seed is a wholeness that carries future growth. The seed is not only closed, but also potentially capable of unfolding. The future exists within it in a condensed form. It demonstrates that form may precede its external manifestation as a possibility. The seed is therefore one of the central images of the hypothesis: it connects materiality, hidden order, time and development. Through the seed, the transition from potential to manifest structure becomes comprehensible.

The flower, by contrast, represents a form that has already unfolded. It demonstrates the transition from a closed bud to a radial, multilayered and visible organisation. In the flower, the centre, periphery, petals, layers, axis, symmetry and minor departures from it, the active edge, and the connection with the fruit and new seed all become manifest. The flower may therefore be understood not only as a symbol of beauty or life, but also as a model of unfolding. It demonstrates that form does not appear immediately in its completed state, but passes from hidden integration to open organisation.

The star adds to this system an image of complete radial manifestation. In cultural symbolism, the star is associated with the sky, light, height, divine order, direction and a completed radiating structure. In a morphogenetic interpretation, the stellate form may be regarded as the fullest unfolding of the centre into a radial organisation. The internal has already become external: the

centre is no longer closed, but is expressed through diverging directions. This is why the star is frequently placed alongside the circle, flower, sun, seed and World Tree. It continues the same logic: from the centre to a multiplicity of rays.

These images — the tree, circle, seed, flower and star — must not be conflated with scientific models. They arose within a different system of thought. They may, however, be translated into the language of modelling if the structural relationships they contain are clearly defined. Part of their symbolic multiplicity of meaning is lost through this translation, but analytical precision is gained. A symbol becomes a model when we cease to ask only 'what does it mean?' and begin to ask 'which structure and process does it record?'.

This transition is particularly important in the analysis of ancient artefacts. A bas-relief, ornament, cultic composition or sacred scheme may be read at different levels. An art historian will study its style, period, technique and composition. An archaeologist will investigate its origin, function and archaeological context. A scholar of religion will examine its ritual and mythological meaning. A philosopher of form may pose an additional question: which morphological scheme is recorded in this image? Does it contain an axis, centre, stage of unfolding, branching, a connection between seed and fruit, or a transition from the closed to the open? Such a question does not invalidate other approaches, but introduces a new level of analysis.

Within the hypothesis of the Unified Matrix of the Universe, this level of analysis is necessary because the author's idea rests not only upon natural forms, but also upon enduring cultural images. If the symbols of different cultures genuinely preserve similar morphogenetic schemes, they may indicate that human beings have long recognised the recurrence of forms in nature. They may not have explained it mathematically, but they saw, experienced and recorded it in images. In this sense, symbolic culture may be regarded as an early form of morphological knowledge, although not scientific knowledge in the modern sense.

A strict boundary must be drawn here. The cultural recording of a regularity is not equivalent to scientific evidence for that regularity. If an ancient symbol contains the image of a tree, it does not prove a universal theory of morphogenesis. If a bas-relief contains a circle, crescent and star, this does not prove that its creator was describing stages in the unfolding of form in the modern scientific sense. If sacred geometry is organised around a centre and nested levels, this does not make it a mathematical model of self-organisation in the strict sense. All these materials may nevertheless be included at the philosophical-hermeneutic level of the study as cultural forms that preserve observations concerning the structure of the world.

This distinction protects the hypothesis from arbitrariness. Without it, any image could be interpreted as confirmation of the Matrix, thereby destroying the scientific value of the study. A different procedure is required: first, the symbol must be defined in terms of its cultural function; second, its morphological structure must be identified; third, this structure must be compared cautiously with natural models; and only then may a conclusion be drawn concerning a possible invariant. In other words, the path must lead not from a desired idea to the symbol, but from analysis of the symbol to a possible model.

The transition from symbol to model also requires an understanding that a symbol is always broader than a model. A model strives for precision; a symbol preserves an excess of meaning. A tree as a model may be divided into root, trunk, branches, crown, fruit and seed. A tree as a symbol, however, encompasses life, lineage, memory, the vertical order of the world, the connection between generations, death and rebirth. A circle as a model may represent an initial closed form. A circle as a symbol, however, encompasses eternity, heaven, the sun, perfection,

return, boundary and wholeness. It is therefore important that the book should not destroy the symbolic richness of ancient images, but carefully extract their morphological core.

It is precisely this morphological core that connects symbol with model. In the tree, this core consists of the axis and branching. In the circle, it consists of the centre and closed wholeness. In the seed, it is the hidden potential of a future form. In the flower, it is unfolding, radiality and layering. In the star, it is the radial manifestation of the centre. In the spiral, it is growth through repetition and displacement. In the lotus, it is multilayered unfolding from the centre. In the mandala, it is a nested structure of levels. In the bas-relief, it is the compositional axis and sequence of signs. Once these cores have been identified, the symbol may be compared with natural forms not as 'evidence', but as a structural analogue.

A contemporary understanding of a morphogenetic model requires precisely this form of analysis. A model must describe a process rather than merely designate an image. If the circle is regarded as an initial state, it is necessary to demonstrate how unfolding emerges from it. If the seed is regarded as potential, it is necessary to explain how potential becomes structure. If the flower is regarded as a manifest form, it is necessary to describe the stages of the bud, opening, radial organisation and fruit formation. If the tree is treated as a model, it is necessary to demonstrate the movement from root to trunk, from trunk to branches, from branches to leaves and fruit, and from fruit to a new seed. Only then does a symbolic form become a morphogenetic scheme.

In this respect, the hypothesis of the Unified Matrix of the Universe may offer a distinctive way of reading ancient images. It does not claim that all cultures possessed a single secret science. It makes a more cautious and more interesting claim: the same morphological observations may have been recorded independently in different cultures because nature itself presents human beings with recurrent forms. The tree, flower, circle, star, seed and spiral were available for observation everywhere. Their universality in culture may be connected not only with exchanges between traditions, but also with the universality of natural experience.

This does not negate historical influences and cultural borrowings. On the contrary, every specific symbol has its own history. Alongside the history of an image's dissemination, however, another problem arises: why do these particular images prove so persistent? Why does the tree become a model of the world? Why does the circle become an image of wholeness? Why do the flower and lotus become signs of unfolding? Why is the star associated with a completed radial form? Why does the seed become an image of beginning? The answer may lie in the fact that these images are based upon fundamental morphological processes that human beings continually observe in nature.

The transition from symbol to model is therefore not an arbitrary modernisation of antiquity. It is possible if three conditions are observed. First, the symbol must be considered within its own cultural context and not completely detached from history. Second, its morphological structure must be identified: the centre, axis, layers, branches, radiality, spiral, edge and stage of unfolding. Third, this structure must be compared with natural forms not as a direct identity, but as a possible invariant of organisation. Only under these conditions can a symbol become material for a model.

An important result of this approach is that ancient images cease to be merely the 'mythological embellishments' of culture. They may be understood as forms of early structural thought. Human beings did not merely recount myths; they also observed the order of the world. They saw how form is born, grows, unfolds, branches, recurs and returns to the seed. They transferred these

observations to the cosmos, society, the body, the temple, the image and ritual. In the symbol, a natural regularity became a scheme of meaning. A contemporary morphogenetic model may return to this scheme, but with a different set of scientific, philosophical and analytical instruments.

Within the hypothesis of the Unified Matrix of the Universe, this means that cultural symbols may serve as an intermediate link between the observation of nature and a theoretical model. They do not replace scientific data, but demonstrate that the problem of form possesses a profound historical memory. Human consciousness has long recognised the recurrence of the centre, axis, circle, tree, seed, flower, star and spiral. The contemporary task is not to proclaim these symbols a fully developed science, but to understand which stable morphological invariants they may have recorded.

The path from symbol to model is therefore not a rejection of the symbol, but its analytical refinement. The symbol preserves depth of meaning, while the model extracts a structural principle from it. The symbol speaks in the language of imagery; the model, in the language of relationships, functions and stages. A symbol may inspire a hypothesis, but a model must make that hypothesis testable and open to discussion. If these levels are not conflated, ancient images become not a weakness of the hypothesis, but important cultural and philosophical material demonstrating that the problem of form was present in human thought long before the emergence of modern science.

For this reason, the tree, circle, flower, star, seed, lotus, world axis, bas-relief and sacred geometry will be considered in the subsequent study not as mystical evidence for the Unified Matrix, but as cultural forms that may have recorded an observable natural logic of morphogenesis. Their significance lies not in replacing a scientific model, but in revealing the historical depth of the question: why have human beings returned so persistently to the same images of form, growth, unfolding and wholeness?

1.4. The Limits of Philosophical Interpretation

Philosophical interpretation is necessary for the hypothesis of the Unified Matrix of the Universe, but its possibilities are not unlimited. It helps to formulate the problem, define the meanings of concepts, discern connections between disparate fields of knowledge, and articulate the general question of form, matter, becoming and wholeness. Philosophical interpretation cannot, however, replace empirical testing, mathematical formalisation, morphometric analysis or the comparison of data. This distinction is a fundamental prerequisite for the scientific integrity of the entire study.

The hypothesis of the Unified Matrix of the Universe lies at the boundary between science and philosophy. This position opens up broad possibilities, but at the same time creates methodological risks. On the one hand, without a philosophical dimension, the hypothesis might disintegrate into a collection of isolated observations: here a flower resembles a nebula, there a stone is reminiscent of a bud, while elsewhere an ancient symbol contains an axis and branching. On the other hand, if philosophical generalisation becomes detached from testable material, the hypothesis will turn into a free-standing metaphysical construct. The task, therefore, is not to reject philosophy, but to define its proper place precisely.

Philosophy helps us to identify a question where a particular science often sees only its own object of study. The biologist studies the development of an organism; the geologist, the formation of relief; the cosmologist, the distribution of matter; and the cultural historian, symbols and artefacts. A philosophical perspective makes it possible to ask whether these fields share a common level of description. Can form be understood as a mode of organising matter? Why do the centre, axis, branching, layering, radiality, spirality and self-similarity recur in different systems? These questions are not purely empirical, but they establish a direction for future empirical research.

It is precisely here that the positive role of philosophical interpretation lies. It establishes the conceptual framework of the problem. It makes it possible to move from external resemblance to the concept of a morphological invariant. It helps to distinguish form as contour from form as organisation. It introduces the categories of potentiality, actualisation, becoming, wholeness, boundary, centre and periphery. Without these categories, the hypothesis would be impoverished: it would remain at the level of visual comparisons and could not aspire to profound theoretical development.

Philosophical reflection, however, does not in itself prove the hypothesis. It is possible to reason persuasively about the centre, axis, seed, unfolding and wholeness, but such reasoning does not yet demonstrate how frequently these features actually recur in independent natural systems. An ancient bas-relief may be interpreted elegantly as a scheme of the unfolding of form, but this interpretation does not prove that its creator intended precisely that meaning. The World Tree may be viewed as a universal model of growth, but this does not remove the need for historical, religious and cultural analysis. Philosophical interpretation discloses meaning, but it does not substitute for verification.

The principal danger here lies in conflating levels of evidential status. If a philosophical image is presented as a scientific fact, the hypothesis becomes vulnerable. The “circle-seed”, for example, may constitute a productive philosophical and morphological model of an initial potential form. It must not, however, be presented as an already established universal physical law. The model of “leaf-like unfolding” may help to describe the transition from a closed structure to a multilayered, unfolded form. Yet it requires clarification: where does this unfolding constitute biological growth, where does it represent geological deformation or cosmic dynamics, and where does it function as a symbolic scheme? Without such clarification, metaphor begins to masquerade as explanation.

Philosophical interpretation is at its strongest when it acknowledges its own status honestly. It should not employ the language of conclusive proof when what is under discussion is a hypothesis, model or possible meaning. Scientifically appropriate formulations include: “may be regarded as”, “suggests the possibility that”, “functions as a morphological model”, “may be interpreted as”, “exhibits a structural resemblance”, and “indicates a possible invariant”. Less appropriate are assertions that close the question in advance: “proves”, “provides indisputable evidence”, “directly confirms”, or “demonstrates unequivocally”. In the present study, such caution is not a weakness. On the contrary, it strengthens the research.

Particular caution is required when dealing with cultural symbols. The tree, circle, flower, star, seed, lotus, mandala, yantra or bas-relief may indeed contain morphologically significant structures. They do not, however, exist outside their historical contexts. Each symbol has its own cultural history, ritual function, artistic tradition, religious semantics and social environment. Ignoring this context can easily lead to an ancient image being ascribed a modern meaning that it

never possessed. A philosophical and morphological reading should therefore be presented as one possible level of analysis, rather than as a definitive substitute for historical interpretation.

The same applies to visual analogies found in nature. Similarity of form does not entail identity of origin. A flower and a nebula may possess radiality, a centre and an unfolding periphery, but their physical natures are different. A leaf and a river system may both display branching, but the mechanisms governing the growth of a leaf vein and the formation of a river channel are not the same. A stone may resemble a bud or fruit, but this does not make it a biological object. Within the hypothesis of the Unified Matrix of the Universe, such comparisons are admissible only at the level of morphological structure, not at the level of direct causal identity.

Philosophical interpretation should help not to erase differences, but to preserve them within a common framework. This is a subtle but necessary position. If differences are ignored, the hypothesis becomes a universalism without criteria. If the common framework is rejected entirely, the very object of the study—the recurrence of morphological principles—disappears. The book must therefore maintain a clear boundary throughout: objects differ in origin, material composition, scale and mechanism, yet some of their structural features may be comparable. It is precisely this comparability that requires further analysis.

Scientific caution also entails acknowledging alternative explanations. The recurrence of forms may have a variety of causes. In some cases, it is associated with common physical constraints: energy minimisation, stress distribution, surface optimisation, diffusion, gravity, rotation or flow. In others, it is associated with mathematical regularities of growth and branching. At times it may be attributable to characteristics of human perception, which tends to identify familiar images. In still other cases, it may arise from cultural tradition and the borrowing of symbols. The hypothesis of the Unified Matrix of the Universe must take all these possibilities into account rather than excluding them in advance.

It is for this reason that the philosophical concept of the Matrix must be used rigorously. In this book, the Matrix is understood not as a hidden object, a supernatural programme or an external force governing all objects. The Matrix is regarded as a hypothetical structural logic of form generation—that is, as a means of describing recurrent morphogenetic invariants. Such an understanding leaves room for scientific testing. If the invariants are indeed robust, they can be identified, classified, measured and compared. If they prove to be coincidental or subjective, the hypothesis must be restricted or revised.

The boundary of philosophical interpretation lies where the requirement of verification begins. Philosophy may state that form expresses the internal order of a system. Science, however, must demonstrate precisely which features of that form recur, how frequently they do so, in which classes of objects, under what conditions and according to which parameters. Philosophy may propose a model of transition from seed to unfolding, but research must determine whether such a model Is applicable to specific natural systems or remains merely a figurative scheme. Philosophy may assert the significance of the centre and axis, but morphometry must establish how these features are to be recorded and compared.

The further development of the hypothesis therefore requires a transition from interpretation to procedure. Image catalogues must be compiled, features classified, tables of invariants constructed, fractal analysis applied, contours compared, types of branching identified, symmetry measured, and layering and radiality analysed. Only in this way is it possible to test whether the hypothesis describes an objective recurrence of forms or merely the researcher’s

impression. A philosophical idea must be prepared to confront material that may refine, restrict or partially refute it.

This is particularly important if the study is to be taken seriously by the scientific community. Science does not demand that a hypothesis be complete from the outset, but it does require clarity regarding its status. A hypothesis may be bold, novel, interdisciplinary and even unconventional. It must, however, indicate honestly which of its propositions are already supported by recognised scientific models, which are comparative observations, which belong to philosophical generalisation and which remain symbolic interpretations. Without such distinctions, even a powerful idea will appear vulnerable.

Philosophical interpretation must also avoid the temptation of absolute universality. Every major hypothesis seeks to provide a broad explanation. Yet the broader the explanation, the greater the risk of losing precision. If the Matrix is used to explain everything without exception, it will cease to explain anything in particular. The hypothesis must therefore have limits of applicability. It may be productive where recurrent morphogenetic features can indeed be identified: centred organisation, axiality, layering, branching, radiality, spirality, self-similarity and staged unfolding. Where such features are absent or cannot be rigorously identified, however, the hypothesis must not be imposed.

The boundary of interpretation is also a matter of language. The terms “code”, “matrix”, “law”, “memory of form”, “unfolding”, “seed” and “internal potential” possess considerable expressive power, but they may be understood too literally. Each of these concepts therefore requires clarification. “Code” does not necessarily mean genetic or digital code. “Matrix” does not signify a material lattice or mystical mechanism. “Memory of form” does not imply conscious recollection. “Seed” does not always denote a biological seed, but may function as a model of an initial potential structure. Such control of language is necessary if philosophical metaphor is not to replace analytical concepts.

In this sense, scientific caution does not destroy the imaginative power of the hypothesis. On the contrary, it makes that power manageable. A sound scientific and philosophical hypothesis may employ powerful images, but it must be capable of translating them into concepts. The image of a seed is translated into the concept of a potential closed structure. The image of a flower becomes the concept of unfolding, radiality and layering. The image of a tree becomes the concept of an axis, branching and a hierarchy of levels. The image of a star becomes the concept of ray-like organisation around a centre. The image of a circle becomes the concept of initial wholeness. Once this translation has been accomplished, philosophical interpretation becomes not an embellishment of the text but an instrument of thought.

Even after such a translation, however, a distinction remains between a concept and proof. A concept helps us to perceive an object differently, but it does not establish the reality of all the proposed connections. Every strong philosophical formulation must therefore be accompanied by the question: how can this be tested? Can the feature in question be measured? Can independent samples be compared? Can a morphological invariant be distinguished from a coincidental resemblance? Can it be shown that an analogous structure arises in different systems for objective reasons? Can the limits beyond which the model ceases to operate be specified? These questions must accompany the hypothesis throughout the study.

It is also important to recognise that philosophical interpretation addresses holistic meaning, whereas empirical verification often deals with individual parameters. A tension inevitably arises between these two levels. Philosophy speaks of form as a manifestation of internal order. Image

analysis measures contour, symmetry, fractal dimension, branching or radiality. These levels do not coincide completely, but they can support one another. Philosophy poses the general question, while empirical procedures test particular aspects of that question. It is in precisely this way that the hypothesis can develop without losing depth or abandoning testability.

Within the present study, philosophical interpretation will perform four principal functions. First, it will establish the conceptual framework of the hypothesis: form, matter, becoming, potential, unfolding, wholeness and invariant. Second, it will help to connect different disciplinary fields without conflating them. Third, it will elucidate the meaning of cultural and symbolic materials. Fourth, it will formulate questions that can subsequently be translated into research procedures. None of these functions, however, amounts to conclusive proof of the hypothesis.

Philosophical interpretation must consequently remain open-ended. It must not close the investigation with a predetermined conclusion. A sound philosophical framework does not declare that “everything has already been proved”. It states that “there is a problem here that must be investigated”. It indicates a direction while remaining open to refinement. It articulates meaning while acknowledging the need for verification. It creates a language without negating the data. It is precisely this kind of philosophy that the hypothesis of the Unified Matrix of the Universe requires.

This, then, is the boundary of philosophical interpretation: it can substantiate the significance of a question, but it cannot by itself confirm the answer. It can demonstrate why form matters, why the recurrence of morphological principles deserves attention, why ancient symbols may be included in the analysis, and why the concept of the Matrix is productive as a meta-theoretical model. Yet without empirical work, it cannot prove that the identified invariants objectively recur in all the systems under consideration. This requires the next level of research: comparative, morphometric, fractal, mathematical and experimental.

The hypothesis of the Unified Matrix of the Universe must therefore be developed as a philosophically grounded yet scientifically testable research programme. Its strength does not lie in declaring, without evidence, that all forms are manifestations of a single principle, but in proposing a cautious and productive path: from the philosophical question of form to the identification of morphological invariants; from symbol to model; from visual analogy to classification; and from image to testable procedure.

This understanding brings the first chapter to a close. Form has been examined as a philosophical category, as a mode of organising matter, as a manifestation of a system’s internal potential, and as a possible bridge between symbol and scientific model. At the same time, clear boundaries have been established: philosophy does not replace proof, a symbol is not equivalent to a model, and visual resemblance does not directly confirm a law. These limitations do not weaken the hypothesis, but establish the conditions for its rigorous development. Only by accepting these boundaries can we proceed to the next step—the analysis of self-organisation as a universal principle in the development of systems.

Chapter Two

Self-Organisation as a Universal Principle in the Development of Systems

2.1. Order from Chaos

One of the most important shifts in the scientific understanding of nature was the recognition that order does not always have to result from external design. In classical thought, an ordered structure was often understood as something predetermined: if a form exists, there must be an external plan, blueprint, control centre or force that organises it. Developments in physics, chemistry, biology, complex systems theory and synergetics have shown, however, that in many cases order can arise from the dynamics of the system itself. It is not imposed from without, but emerges from within—through the interaction of elements, flows, constraints, fluctuations and non-equilibrium states.

This proposition is of fundamental significance to the hypothesis of the Unified Matrix of the Universe. If natural forms arise not only through external influence but also as manifestations of systems' intrinsic capacity for self-organisation, then the recurrence of morphological structures at different levels of matter acquires a new meaning. The centre, axis, spiral, branching, radiality, layering, fractality and self-similarity may be regarded not as coincidental visual motifs, but as possible ways in which complex systems attain stable form.

The expression 'order from chaos' should not be understood literally as the instantaneous emergence of an ideal structure from complete disorder. In scientific terms, chaos more often denotes not the absolute absence of laws, but a state of high uncertainty, instability and a multiplicity of possible directions of development. A system may find itself in a state in which minor changes are capable of producing different outcomes. No definitive structure has yet emerged, but the conditions under which a structure can arise are already present. In this context, therefore, chaos is not emptiness but a field of possibilities.

This approach is particularly important for understanding form as a process. Form does not arise from nothing. It emerges when particular connections become established within a system, when some directions of development are amplified and others suppressed, and when random oscillations cease to be merely random and become the beginning of a new order. In other words, order arises not in spite of chaos, but through an engagement with instability. Chaos functions here not only as a threat of disintegration, but also as a condition for the emergence of the new.

The key concept in this understanding is non-equilibrium. A system in equilibrium tends to preserve its existing state. It is stable, but often impoverished in terms of development. In a state of complete equilibrium, there is little scope for new form to emerge, because all processes are balanced, differences are smoothed out and directions of movement are suppressed. A non-equilibrium system, by contrast, exists in a state of tension: flows of energy, matter or information pass through it; gradients, differentials and local variations arise within it; and it is compelled to reorganise itself in order either to survive or to enter a new state.

It is non-equilibrium that makes self-organisation possible. A system far from equilibrium does not simply disintegrate. Under certain conditions, it can create a new order that is more complex and stable than its previous state. Such order arises not because someone imposes a ready-made scheme from outside, but because the internal dynamics of the system lead to the selection of a particular structure. This structure may take the form of a chemical pattern, a vortex flow, a crystal lattice, a biological pattern, a landform, a cloud formation or a distribution of matter in the cosmic environment.

Non-equilibrium may be understood as a state of openness. The system is not completely closed in upon itself. It exchanges with its environment, receives and loses energy, redistributes matter, and responds to pressure, temperature, fields, flows, resistance and boundaries. It is precisely through this exchange that the system is capable of change. A closed system in complete equilibrium is more likely to preserve a given state. An open, non-equilibrium system is capable of development because it continually exists in relation to the external world.

For the hypothesis of the Unified Matrix of the Universe, this means that form must be regarded not as a static figure, but as the result of interaction between a system's internal potential and external conditions. A seed does not unfold in a vacuum: it requires water, soil, light, temperature and an appropriate chemical environment. A mountain fold does not arise in isolation: it is associated with pressure, rock composition, time and tectonic movement. A nebula forms in a cosmic environment governed by gravity, radiation, expansion, gas density and shock waves. Even a cultural symbol arises not from an empty imagination, but within a particular environment of observation, tradition, images and meanings.

A second important concept is fluctuation. A fluctuation may be defined as a minor deviation, oscillation or local change within a system. In a stable equilibrium state, fluctuations usually subside: the system returns to its previous condition. In a non-equilibrium system, however, a fluctuation may become amplified. A minor deviation becomes the beginning of a new structure. Here one of the principal tenets of self-organisation becomes apparent: not every order is predetermined; sometimes it grows out of an amplified deviation.

This is particularly evident at the level of form. A small break in symmetry may initiate the formation of an axis. A slight difference in density may lead to the emergence of a centre. A local direction of flow may form a channel. A small crack may become a fault line. The first fold may establish the rhythm of subsequent folds. A slight displacement in tissue growth may determine the future form of an organ. In this sense, a fluctuation is not merely noise. Under certain conditions, it becomes the germ of order.

This reveals the connection between self-organisation and morphogenesis. Morphogenesis—the emergence and development of form—often begins not with a ready-made complex structure, but with a small difference. Where everything is absolutely identical, form has yet to be expressed. For a structure to emerge, a distinction must appear: centre and periphery, top and bottom, inner and outer zones, greater and lesser density, active and passive regions, a direction of growth and an area of resistance. This distinction may initially be minimal, but if the system is in an appropriate state, it begins to unfold.

Symmetry breaking is one of the fundamental mechanisms of this transition. Symmetry is often associated with initial wholeness and potentiality. It indicates that the system has not yet selected a particular direction of development. Development, however, requires a choice. For a form to become individual, symmetry must be partially broken. This does not mean the destruction of order. On the contrary, the breaking of simple symmetry may produce a more

complex order. A bud unfolds, losing its initial closure. A crystal develops facets as it emerges from a solution or melt. A flow forms a vortex, disrupting the uniformity of motion. A cosmic cloud becomes denser, creating a centre and periphery.

In this sense, order from chaos arises as a transition from an indeterminate multiplicity of possibilities to a particular structure. Before a form emerges, the system may develop along different paths. Once a structure has formed, some possibilities are closed off, but a new stability appears. Form always constitutes a choice. It fixes one of the possible scenarios for the organisation of matter. This choice, however, need not be made by an external intelligence or plan. It may result from the internal dynamics of the system, its conditions, constraints and interactions.

The concept of a stable structure helps to explain why self-organisation cannot be reduced to a random pattern. In a chaotic or unstable environment, short-lived configurations may arise and quickly disappear. Self-organisation, however, implies that certain structures prove capable of persisting. They are stable not because they are motionless, but because they are dynamically maintained. In a living organism, form is maintained through metabolism, regulation, growth and regeneration. In a flow, a vortex persists through motion. In a crystal, structure is maintained by the internal order of the lattice. In a landscape, form may persist through a balance between uplift, destruction and erosion. In a cosmic structure, stability may be sustained by gravity, rotation or the distribution of matter.

Such stability does not always mean rest. On the contrary, many stable structures are dynamic. They exist through continual movement, exchange and reorganisation. A living form preserves itself through constant renewal. An atmospheric vortex exists through a flow of energy. A river system retains its overall pattern even though the water is continually changing. A galactic structure preserves its form despite the motion of stars and gas. Order in complex systems is therefore not lifeless immobility, but organised dynamics.

This is especially important for the hypothesis of the Unified Matrix of the Universe. The Matrix must not be understood as a rigid, static template. If the Matrix is regarded as a structural logic of form generation, that logic must be dynamic. It manifests itself not in all forms being identical, but in different systems passing through similar stages of organisation: concentration, symmetry breaking, the emergence of an axis, the formation of layers, unfolding, branching, stabilisation, reproduction or transition to a new state. Here order is not prescribed as a ready-made figure; it emerges as a process.

Self-organisation also shows that chance and regularity are not necessarily opposites. In complex systems, a random deviation may become part of a regular process. A fluctuation may be random in origin, but if it is amplified by the system and incorporated into its subsequent dynamics, it becomes structure-forming. This is how the individuality of form arises. Two plants of the same species are similar but not identical. Two snowflakes share the same principle of crystallisation but differ in their details. Two river networks obey similar laws of drainage but possess unique patterns. Two nebulae may display similar types of shell-like structure or radiality while retaining their own forms. In nature, order rarely eliminates variation; it organises it.

Here an important route to understanding recurrence and difference becomes apparent. If a common morphogenetic principle exists, it need not produce identical forms. It may establish a type of organisation within which innumerable variations are possible. A centre may be explicit or concealed. An axis may be vertical, inclined, displaced or multiple. Layering may be regular or disrupted. A spiral may be tightly wound or open. Branching may be tree-like, networked, radial

or chaotic. Universality therefore does not exclude individuality. On the contrary, an individual form may represent a particular variant of a general principle.

Order from chaos is manifested not only in living systems. This is of fundamental importance to the present study. If self-organisation were characteristic only of biology, the hypothesis of the Unified Matrix of the Universe would remain confined to organic morphogenesis. Natural systems, however, demonstrate that self-organising structures also arise in non-living matter. Crystals, vortices, waves, cracks, river channels, clouds, mountain folds, atmospheric processes, cosmic shells and galactic structures display various forms of order arising through the interaction of elements and forces.

Crystallisation provides a simple and illustrative example: under certain conditions, an ordered structure emerges from a solution or melt. The form of a crystal is not arbitrary. It expresses the internal order of the substance and the conditions of growth. A vortex demonstrates how a flow that might appear chaotic becomes organised into a rotating structure. A river network shows how water moving across a surface gradually creates a stable drainage pattern. Cracks in drying clay or rock reveal how stress is distributed in the form of recurrent lines. Clouds and nebulae display complex contours, layers, filaments and regions of density arising from the movement of the medium.

These examples do not automatically prove the existence of a unified Matrix, but they demonstrate something of fundamental importance: order is not an exclusive property of living systems. Non-living matter is also capable of structural self-organisation. This allows us to speak of a broader field of morphogenesis. Biological form remains distinctive because it is associated with life, heredity, metabolism and reproduction. Yet the principle by which form emerges from a system's dynamics extends beyond biology. It is present in physics, chemistry, geology, cosmology and, in a particular sense, culture.

In culture, order from chaos has a different character. It concerns not the physical self-organisation of matter, but the formation of stable symbolic structures from a multiplicity of impressions, observations and meanings. Human beings encounter the diversity of the world and gradually identify recurring forms within it: the circle, tree, star, seed, spiral, flower, axis and branching pattern. These forms become established in ornaments, myths, bas-reliefs, architecture and sacred geometry. Cultural form does not arise in the same way as a crystal or plant, but it may likewise be regarded as a means of ordering experience. Cultural material must therefore be assigned a distinct philosophical and hermeneutic level within the hypothesis, without being excluded from the general problem of form.

An understanding of self-organisation must also take account of the role of constraints. Order does not arise under conditions of complete freedom, but within constraints. The form of a leaf is associated with a biological programme, the mechanics of growth, light, surface area, venation and its edge. The form of a river channel depends upon the gradient, soil composition, water velocity, obstacles and climate. The form of a mountain fold is associated with pressure, the plasticity of rocks, temperature and time. The form of a nebula depends upon gas density, radiation, gravity, shock waves and the surrounding medium. A constraint does not merely impede development; it directs it. Without constraints, form would remain indeterminate.

Self-organisation is therefore not the magical self-generation of order. It requires particular conditions: an open system, non-equilibrium, a flow of energy or matter, fluctuations, internal connections, external constraints and the possibility of amplifying small differences. When these conditions are present, a system can enter a new order. This transition is often accompanied by

symmetry breaking and the emergence of a centre, axis, rhythm, layers, branching or boundary. It is these features that subsequently become visible as form.

Order from chaos may also be understood as a transition from indeterminacy to distinguishability. While a system remains unorganised, its elements are difficult to describe as a whole. When form emerges, the system becomes distinguishable. It acquires a contour, direction, structure and internal logic. Yet this distinguishability need not be absolute. Natural forms frequently retain traces of chaos: an uneven edge, deviation, asymmetry, rupture, random line or variation in detail. A mature form therefore does not eliminate chaos entirely. It incorporates chaos as a source of individuality.

This idea is particularly important in the analysis of natural images. If the Matrix is expected to exhibit ideal geometry, most natural forms will appear ‘imperfect’. Nature, however, does not operate like a draughtsman producing smooth diagrams. Its order exists in tension with deviation. A flower displays symmetry, but each petal is different. A leaf possesses an axis, but its edge may be irregular. A landscape exhibits a direction of folding, but its folds have been disrupted by erosion. A nebula may have a centre and a shell, but its boundaries are ruptured. This imperfect regularity is characteristic of self-organising systems. It is closer to actual nature than an ideal scheme.

The hypothesis of the Unified Matrix of the Universe must consequently seek not mechanical regularity, but stable principles of organisation within variable forms. Order from chaos does not mean transforming the world into a collection of ideal geometrical figures. It means the emergence of stable structures within an unstable, dynamic and multifactorial reality. These structures may involve recurrent motifs, rhythms, centres, axes, branches, layers, edges, spirals and radial unfoldings. They may be displaced, disrupted or deformed while retaining a recognisable morphological logic.

In philosophical terms, self-organisation demonstrates that form does not necessarily require an external designer in order to be meaningful. Order may be immanent—that is, it may arise from within the system itself. This does not eliminate the question of the fundamental laws of nature, but places it on a more rigorous footing. Instead of asking ‘who created this form?’, we ask ‘what conditions and principles allowed this form to arise?’ For scientific research, this represents a fundamental shift. It makes it possible to speak of regularity without mystification, and of wholeness without abandoning analysis.

For the hypothesis of the Unified Matrix of the Universe, the concept of order from chaos performs a fundamental function. It prepares the way for understanding the Matrix not as an external force, but as a possible structural logic of self-organisation. If different systems, existing in non-equilibrium states and undergoing symmetry breaking, arrive at similar morphological solutions, there are grounds for seeking universal invariants of form. These invariants must not be understood as ready-made templates. They are recurrent modes of organisation: centred organisation, axial development, radial unfolding, layering, branching, spirality and fractal repetition.

The concept of order from chaos thus provides a scientific foundation for the analysis that follows. It demonstrates that the complexity of nature cannot be reduced to disorder, and that order does not necessarily require external design. Between chaos and form lies the domain of self-organisation, in which fluctuations are amplified, symmetry is broken, non-equilibrium becomes a source of development, and stable structures arise from the system’s internal

dynamics. It is in this domain that the first foundations should be sought for the hypothesis of the Unified Matrix of the Universe as a model of universal morphogenetic order.

2.2. Synergetics and Non-Linear Processes

If the concept of self-organisation makes it possible to explain how order can arise without external design, synergetics provides a broader language for describing such processes. It regards complex systems as dynamic wholes in which numerous elements, through their interactions, are capable of generating new structures, regimes and forms of behaviour. The synergetic approach is particularly important to the hypothesis of the Unified Matrix of the Universe because it demonstrates that morphogenesis is not a process of simple linear growth. Form does not arise through the mechanical enlargement of a predetermined prototype, but as a result of interactions among energy, the environment, internal constraints, gradients, stresses, flows and external conditions.

Linear thinking assumes a simple relationship: a cause produces an effect, a small influence produces a small result, a large influence produces a large result, and development proceeds gradually and predictably. This approach is useful and, in many cases, necessary. Complex natural systems, however, frequently behave differently. In such systems, a minor change may trigger a major reorganisation, whereas a powerful influence may sometimes produce almost no change at all. The same cause may produce different consequences under different conditions. A system may remain stable for a long time and then suddenly transition to a new state. Morphogenesis therefore cannot be understood as a straight line from beginning to result.

Form emerges within a field of non-linearity. This means that its development depends not upon a single factor, but upon an assemblage of interrelated conditions. The growth of a plant is determined not only by its genetic programme, but also by illumination, moisture, soil composition, temperature, mechanical obstacles, the direction of gravity, internal hormonal signals, tissue stresses and the history of its previous development. Geological form arises not only under pressure, but through rock composition, plasticity, fracturing, temperature, water, erosion, the rate of tectonic processes and the duration of their effects. Cosmic form cannot be reduced to gravity; it is influenced by gas density, radiation, magnetic fields, shock waves, rotation, turbulence and the distribution of matter.

Form is therefore the result of the coordination of many factors. This coordination does not necessarily occur smoothly. In a complex system, different processes may amplify one another, suppress one another, divert, delay or accelerate development. In one case, the system retains its existing structure; in another, it transitions to a new one. In one case, a fluctuation disappears; in another, it becomes the beginning of a stable pattern. In one case, symmetry is preserved; in another, it is broken and gives rise to an individual form. Such transitions constitute the subject matter of synergetic analysis.

Synergetics introduces the important concept of cooperativity. In a complex system, elements do not simply exist alongside one another. They interact in such a way that an effect of the whole emerges. A single cell does not explain the form of an organism. A single grain of sand does not explain the pattern of a dune. A single drop does not explain the channel of a river. A single star does not explain the form of a galaxy. A single layer of rock does not explain a landscape. Form arises when a multiplicity of elements becomes incorporated into a common regime of

organisation. This regime may be temporary, stable, transitional or cyclical, but it is what makes the system a whole.

In this respect, synergetics is close to the philosophical understanding of form as a mode of organising matter. Form is not located in any single element. It arises between elements—in their connections, relationships, directions, constraints and recurrent interactions. It therefore cannot be explained completely through an analysis of parts alone. It is necessary to understand how the parts begin to function as a whole. This is fundamental to the hypothesis of the Unified Matrix of the Universe: the Matrix, understood as a morphogenetic logic, must describe not individual elements but the way in Ih they are coordinated within a structure.

Non-linearity is manifested, above all, in the presence of feedback. Feedback means that the result of a process begins to influence the process itself. This is particularly clear in living systems: tissue growth changes mechanical stress, and stress affects subsequent growth; the arrangement of cells alters chemical gradients, while the gradients influence cellular behaviour; the form of an organ changes the distribution of forces, and the distribution of forces further refines its form. In geological systems, relief influences the movement of water, while water alters the relief. In the atmosphere, air movement forms cloud structures, while changes in temperature and humidity sustain or destroy them. In the cosmic environment, a concentration of matter intensifies gravitational attraction, and this attraction leads to further concentration.

Feedback may be positive or negative. Positive feedback amplifies change. A small deviation may grow, become increasingly pronounced and shift the system into a new state. Negative feedback, by contrast, stabilises the system, returns it towards equilibrium or maintains its form within certain limits. Morphogenesis is usually associated with the interaction of both types of feedback. Without positive feedback, form would not develop. Without negative feedback, it might disintegrate or become unstable. Mature form therefore arises as a balance between amplification and constraint.

This logic is evident in biological patterns. If a particular region of tissue begins to develop more actively, it may amplify its difference from neighbouring regions. At the same time, however, mechanisms operate that restrict the excessive spread of that difference. The result is not amorphous growth, but a pattern, organ, leaf, petal, vein or segment. A similar principle operates in reaction–diffusion models: local activation is combined with inhibition over a wider area, and the system creates a stable pattern. What matters here is not the specific biological content, but the morphogenetic logic itself: form emerges through the interaction of expansion and constraint.

In geological structures, an analogous role may be played by pressure and material resistance. Tectonic force tends to deform rock, but the properties of the rock itself—its layering, density, degree of fracturing and plasticity—constrain and direct this deformation. The result is not arbitrary chaos, but folding, faults, waves, scarps and recurrent lines. A geological process is, of course, not biological growth. Morphologically, however, it is again possible to observe an interaction between active influence and structural constraint that generates form.

In the cosmic environment, non-linearity is manifested through complex interactions among gravity, gas dynamics, radiation, turbulence and rotation. A cloud of gas and dust may condense, fragment, form star-forming regions, shells, filaments or spiral structures. Small differences in density may become amplified. Flows of matter form boundaries and edges. Explosive processes create expanding shells. Rotation produces spiral configurations. Once again, it must be emphasised that this does not mean that the cosmos ‘grows’ like a plant. It means that non-linear processes in different environments are capable of producing structural organisation.

The idea that form results from the tension between freedom of development and constraint is especially important to the hypothesis of the Unified Matrix of the Universe. If a system is entirely unconstrained, its development may become indeterminate and diffuse. If it is completely fixed, no development takes place. Form arises between these poles. It requires energy and direction, but also a boundary and resistance. A bud unfolds because growth pressure exists within it, yet the form of the flower is also determined by its envelopes, layers, arrangement of petals and external conditions. A river flows downhill, but its channel is shaped by the resistance of the ground. Cosmic matter moves, but its form is determined by gravitational and gas-dynamic constraints.

It follows that the boundary of a form is not a secondary detail. In synergetic terms, a boundary is the zone in which the system interacts with its environment and where non-linear processes are most clearly manifested. The edge of a leaf, petal, crack in stone, mountain fold, coastline, cloud or nebula is often the most complex region of the form. It may be undulating, serrated, scalloped, ruptured, layered or branching. It is at the edge that the interaction between internal organisation and external conditions becomes visible. The edge is not merely the termination of form, but an active zone of its becoming.

This idea is directly relevant to the model of ‘leaf-like unfolding’. A leaf or petal is significant not only because of its surface, but also because of its edge. The edge reveals the rhythm of growth, the direction of extension, the interaction between tissue and environment, and the distribution of stresses. Transposed to a broader morphological level, this suggests that an active periphery is one of the features of a developing form. In a mountain landscape, this periphery may be a fold or rupture line; in a nebula, a luminous or fragmented contour; in a stone, the surface where internal layers become exposed; and in cultural geometry, an ornamental boundary marking the transition from the centre to the outer circle.

Non-linear processes are also associated with the concept of a threshold. A system may accumulate changes for a long time without altering its external form, before entering a new regime once a critical state has been reached. Before the threshold, the changes are concealed or almost imperceptible. Beyond it, they become visible. In biology, this may be manifested in an abrupt transition between developmental stages. In geology, it may occur at the moment of a fault, displacement or collapse. In chemical systems, it may appear as the emergence of a pattern. In cosmic processes, it may occur at the onset of collapse, ejection or fragmentation. Threshold behaviour demonstrates that the becoming of form is not always uniform.

In the context of the hypothesis, this allows for a deeper understanding of the A–B–C–D sequence of stages. The transition from a closed state to unfolding need not be smooth or linear. Thresholds may exist between the stages: the moment of symmetry breaking, the emergence of an axis, the exposure of an internal layer, the formation of branching, or the stabilisation of an open form. Each stage may be associated with a new regime of organisation. A–B–C–D should therefore be understood not as a mechanical sequence of images, but as a possible scheme of phase transitions in form.

Non-linearity also explains why the outcome of development cannot be predicted entirely from the initial state. A seed contains the potential of a plant, but the plant’s specific form depends upon its environment and developmental history. A geological structure depends upon the initial composition of the rocks, but its actual appearance is determined by the prolonged interaction of forces. A cosmic cloud possesses a particular distribution of matter, but its subsequent form

depends upon numerous processes. Form is therefore not only the realisation of potential, but also the result of a path. Initial conditions and the history of becoming converge within it.

This is particularly important for the concept of the individuality of form. If development were strictly linear, identical initial conditions would always produce identical results. In complex systems, however, minor differences in conditions may lead to different configurations. Nature therefore produces forms that are recognisable as belonging to a general type but unique in their details. All the leaves of a given plant belong to the same morphological type, yet each leaf is individual. All river networks obey general laws of drainage, yet each has its own pattern. All spiral galaxies may exhibit a similar principle of organisation, but each possesses its own structure of arms. A universal principle does not eliminate variation; it is realised through it.

Synergetics also provides a different understanding of the role of the environment. The environment is not a passive background. It participates in form generation. The form of a plant depends upon light, wind, water, soil and neighbouring organisms. The form of a landscape depends upon climate, water, ice, the movement of rocks and vegetation. The form of a cloud depends upon temperature, humidity, pressure and air currents. The form of a cultural symbol depends upon its material, technique, tradition, ritual function and visual experience. In every case, the environment does not merely surround the form; it enters into the process of its becoming.

At the same time, the system does not simply receive environmental influences passively. It responds to them in accordance with its internal organisation. The same influence may produce different results in different systems. Wind affects a tree, sand, water and a cloud in different ways. Pressure is manifested differently in plastic and brittle rock. Different plants respond differently to light. A cultural image develops differently in different traditions. Form therefore arises from an encounter between the internal and the external, rather than from a single factor.

This has methodological significance for the hypothesis of the Unified Matrix of the Universe. If similar morphological invariants are found in different environments, they cannot be explained solely by invoking a ‘single template’. Each invariant must be understood as being realised through specific conditions. An axis in a plant, an axis in a mountain landscape, an axis in a bas-relief and an axis in a cosmic structure are not one and the same physical object. They may, however, perform similar organisational functions: establishing a direction, connecting levels, maintaining symmetry or marking a process of unfolding. Universality here is functional and morphological, not mechanically identical.

The synergetic approach also helps to overcome a simplistic opposition between chance and necessity. In complex systems, necessity defines the field of the possible, while chance participates in the selection of a particular path. The laws of physics, chemistry, biology and geometry restrict the range of forms. Within this range, however, there remains scope for variation. Fluctuations, local conditions, random influences and developmental history make each form individual. Natural order therefore does not resemble the industrial production of identical objects. It is closer to a grammar: there are rules of construction, but every utterance is unique.

This metaphor of grammar is useful for understanding the Matrix. Within the hypothesis, the Matrix may be represented not as a collection of ready-made images, but as a grammar of form generation. It does not dictate that all objects must be identical. It establishes principles: centred organisation, axiality, layering, unfolding, branching, radiality, spirality, self-similarity, the active edge and the transition from potential to manifestation. A particular form is an ‘utterance’ of this

grammar within a particular environment. A flower, stone, landscape, nebula or symbol does not literally reproduce the others, but may employ similar morphological rules.

Non-linear processes are also important for understanding the temporality of form. Linear time is imagined as a uniform sequence: first one thing, then another, and then a third. In complex systems, however, time may have rhythms, accelerations, delays, reversals, thresholds and cycles. A bud remains closed for a long time and then opens rapidly. A geological structure forms over millions of years, yet individual faults may arise abruptly. A cosmic nebula may preserve its shell-like organisation while its individual regions change at different rates. A cultural symbol may remain almost unchanged for a long period and then acquire a new interpretation. Form possesses not only spatiality, but also its own temporality.

In this sense, morphogenesis is the history of form. It encompasses not only a beginning and an end, but also the rhythm of change. Synergetics makes it possible to regard this history as a sequence of states in which a system transitions from one regime of organisation to another. These transitions are not always reversible. Once a bud has become a flower, it does not return to its former state as a bud. Once rock has been folded, its structure retains a record of deformation. Once a river channel has formed, it directs the subsequent flow. Once a symbol has become established in a culture, it begins to influence new images. Form not only arises in time; it changes the future course of the system.

This capacity of form to become a condition of subsequent development is particularly important. In self-organising systems, once a structure has arisen, it begins to direct later processes. A formed leaf vein directs flows. An established river channel directs water. A crack directs subsequent destruction. A plant's central axis organises branching. A galactic structure influences the movement of matter. A symbolic scheme directs the cultural reproduction of an image. Form becomes not only the result of the past, but also a factor in the future.

This understanding permits a deeper interpretation of cyclicality within the hypothesis. If a form completes one stage and becomes the beginning of the next, it performs the role of accumulated organisation. A fruit becomes the bearer of a seed. The formed surface of a stone preserves traces of an internal process. A destroyed structure may become material for a new structure. A cultural image may become a matrix for new representations. Morphogenesis is therefore not a straight line from emptiness to a finished object. It forms a chain of transitions in which the result of one process becomes the condition of another.

Synergetics also shows that a whole may govern its parts without an external control centre. This is particularly important in complex systems. In an organism, the overall architecture influences the behaviour of cells. In a flow, the general regime of movement affects the trajectories of individual particles. In a landscape, an already formed relief influences the movement of water and subsequent erosion. In a cultural tradition, a general symbolic canon influences specific representations. This influence of the whole upon its parts is not mystical. It is associated with constraints, fields, boundaries, distributions of forces and regimes of interaction. This is important to the hypothesis because the Matrix may be understood as a level of organisation rather than as an external command.

Despite the productivity of the synergetic approach, caution is necessary. It is not sufficient simply to assert that, because self-organisation exists in different systems, they must all be governed by one and the same Matrix. Synergetics reveals general principles, but the specific mechanisms remain different. Biological morphogenesis, geological deformation and cosmic dynamics cannot be reduced to a single process. They may be compared only at the level of

structural functions and general regimes of organisation. This distinction must be maintained throughout the study.

At the same time, synergetics provides legitimate grounds for asking the question of universality. If complex systems of different kinds genuinely exhibit similar regularities—non-equilibrium, fluctuations, thresholds, symmetry breaking, the formation of stable structures, feedback and self-organisation—it becomes possible to investigate whether recurrent morphological forms arise from these regularities. The hypothesis of the Unified Matrix of the Universe thereby acquires not a mystical but a scientific and systemic foundation. It becomes a question of whether common scenarios of form generation exist in complex systems.

Synergetics and the theory of non-linear processes thus allow morphogenesis to be regarded as the result of the dynamic interaction of numerous factors. Form does not arise along a straight line or from a single source. It develops through energy, environment, internal constraints, feedback, threshold states, symmetry breaking, fluctuations, material resistance and developmental history. This is why actual form is simultaneously regular and individual, stable and variable, ordered and open to variation.

For the hypothesis of the Unified Matrix of the Universe, this conclusion is of fundamental significance. If form arises through non-linear self-organisation, recurrent morphological invariants should be sought not in finished external contours, but in processes: centred organisation, axial direction, unfolding, layering, branching, spiral displacement, formation of an active edge, and transition from a potential state to a manifest structure. It is these processes that may form the basis of a universal morphogenetic model, which must next be examined through the concepts of symmetry, symmetry breaking and self-organisation in living and non-living nature.

2.3. Symmetry and Symmetry Breaking

Symmetry is one of the fundamental concepts through which human beings describe the order of the world. It is present in mathematics, physics, biology, crystallography, architecture, art, mythology and philosophy. A symmetrical form is perceived as stable, complete, unified and internally coherent. The circle, sphere, crystal, star, flower, snowflake, shell, mandala and ornament—all these forms evoke a sense of order precisely because they exhibit repetition, balance, proportionality between their parts and a relationship to a centre.

Symmetry alone, however, is insufficient for understanding morphogenesis. If the world remained exclusively symmetrical, it would be stable but static. Development begins where symmetry is broken. Such breaking does not necessarily signify the destruction of order. On the contrary, in many cases it is precisely the breaking of an initial symmetry that creates the conditions for the emergence of a more complex form. Simple symmetry contains potential, but an individual structure arises when this potential begins to unfold through difference.

This proposition is of central importance to the hypothesis of the Unified Matrix of the Universe. The initial state of form may be represented as a closed, relatively symmetrical and potentially rich structure—the ‘circle-seed’. In this state, form has not yet unfolded or become differentiated, and does not yet possess developed layers, branches, edges or directions. It is whole, but its wholeness remains concealed. To enter a manifested form, the system must leave

its state of complete closedness. A difference must arise within it: centre and periphery, top and bottom, axis and lateral directions, internal and external, dense and diffuse, an active zone and a region of constraint. It is precisely this difference that marks the beginning of morphogenesis.

In this understanding, symmetry is not only a geometrical property but also a state of potential. It indicates that the system still contains multiple possible directions of development. A circle may unfold into different structures. A seed may produce a shoot. A bud may open. A homogeneous medium may generate a pattern. A gas cloud may condense, rupture, rotate or form a shell or centre. As long as symmetry remains complete, no particular direction has yet been selected. As soon as a small deviation arises, however, the system begins to pass from potentiality to actual form.

Symmetry breaking may be described as the moment at which form is selected. Before this moment, the system contains many possibilities, but none has yet become dominant. After symmetry is broken, one direction becomes amplified, one region becomes a centre, one line becomes an axis, one edge becomes active, and one rhythm begins to organise subsequent changes. Individuality thus emerges. Form ceases to be an abstract possibility and becomes a concrete structure.

This process is clearly visible in living nature. Before opening, a bud retains relative closedness and symmetry. Its petals are compressed, its layers concealed and its centre unmanifested. Opening, however, begins with the breaking of this closedness. The petals move apart, their positions become differentiated, the internal space opens outwards and the centre becomes visible. The initial symmetry does not disappear completely: the flower retains radiality, rhythm and repetition of parts. This is now, however, a different and more complex symmetry—open, differentiated and filled with variation.

A leaf develops in a similar way. At the beginning, it may be curled, compact and almost undifferentiated. An axis—the central vein—then appears. Lateral veins branch from it. The edge acquires serration, undulation, lobing or another configuration. The leaf becomes not merely a flat figure, but a system of directions and differences. Its form arises through the gradual disruption of its initial compactness. It retains an overall order, but this order is now expressed through asymmetries, minute deviations, inequalities between regions and variability of the edge.

In embryonic development, symmetry breaking plays an even more profound role. A living organism cannot develop from an entirely homogeneous structure unless differences arise within it. Bodily axes, anterior and posterior regions, upper and lower areas, left and right sides, and the zones of future organs and tissues must emerge. These differences are not external embellishments. They determine the very possibility of the organism as a complex whole. Development begins when homogeneity ceases to be homogeneous. Potential space becomes organised.

In non-living nature, symmetry breaking is likewise one of the most important mechanisms of form generation. Crystallisation, for example, begins with the formation of a centre or crystal nucleus. Matter in a solution or melt may be distributed relatively uniformly, but under particular conditions a point arises around which ordering begins. This point disrupts the previous homogeneity and establishes a new structure. Thereafter, form develops not arbitrarily, but in accordance with the internal order of the substance and the conditions of growth.

In geology, symmetry breaking is manifested through cracks, folds, faults, displacements, uplift and subsidence. Under the influence of pressure, temperature, moving water, ice, wind or

tectonic forces, a flat or relatively homogeneous surface begins to differentiate. A line of stress, a zone of rupture, a direction of flow, the axis of a valley, the crest of a ridge or a layered structure appears. This asymmetry is not merely damage. It may become the beginning of a new landform. A fault, crack or fold records the moment at which matter ceased to be uniform and began to organise itself according to a new logic.

Symmetry breaking also plays a decisive role in cosmic systems. A perfectly homogeneous distribution of matter would not have produced stars, galaxies and nebulae in their observed diversity. Structure requires heterogeneity: differences in density, velocity, temperature, rotation, gravitational attraction and direction of movement. Small deviations may be amplified and become centres of future formations. A cloud of matter condenses; a core emerges; and a shell, disc, spiral or system of ejecta forms around it. Cosmic form begins where homogeneity is disrupted and difference becomes structure-forming.

It is important to emphasise that symmetry breaking is not synonymous with chaos. It is not simply the destruction of a previous order, but a transition to a different order. A simple symmetry may be replaced by a more complex organisation. The rounded, closed form of a bud, for example, becomes a radially unfolded flower. A homogeneous medium becomes a pattern. A flat surface becomes a folded landscape. A uniform cloud becomes a structure with a core and periphery. In each case, the initial simplicity is lost, but a richer form takes its place.

From a philosophical perspective, this means that development is impossible without difference. Where there are no differences, there is no direction, no relationship between parts, no internal tension and no history of form. Perfect symmetry may be beautiful as an ideal, but it is insufficient as a developmental state. Life, nature and the cosmos are constantly passing from symmetry to asymmetry, and from asymmetry to a new and more complex symmetry. This rhythm may be regarded as one of the fundamental principles of morphogenesis.

What is particularly important to the hypothesis of the Unified Matrix of the Universe is not symmetry as an isolated property, but its dynamics. Form passes from initial wholeness through a disturbance of equilibrium to differentiation and new stability. In this sequence, symmetry functions as the beginning, asymmetry as the driving force of development, and new form as the result of their interaction. The Matrix cannot therefore be understood as a static symmetrical scheme. It must be regarded as a process in which symmetry unfolds through being broken.

This logic corresponds closely to the ‘circle-seed’ model. Here the circle denotes not a completed endpoint, but an initial potentiality. It is closed and whole, but for that very reason it has not yet unfolded. In order to become a leaf, flower, tree, landscape, spiral or other structure, it must move beyond its closedness. An axis must appear within it, followed by a layer, an edge, a differentiation of directions, and then branching or radial unfolding. The circle-seed is therefore not negated by development, but transformed. The initial symmetry is preserved as a concealed memory of form, but ceases to be its only state.

This understanding helps to avoid an oversimplified conception of the Matrix as a geometrical template. If the Matrix is seen solely in terms of ideal symmetry, the hypothesis will quickly become schematic. Real natural forms are far richer. They contain displacements, deviations, local disruptions, irregular edges, elements of different sizes, partial ruptures and displaced centres. These features are not errors. They demonstrate that form was not drawn with a ruler, but arose through a process of becoming. The study must therefore consider not only symmetry, but also the manner in which it is broken.

Asymmetry is the source of the individuality of form. Two flowers of the same species may share the same general plan while differing in detail. Two shells may follow a similar spiral principle while possessing different proportions. Two mountain structures may display folding, but each will have its own pattern. Two nebulae may possess shells and centres, but their contours will be unique. If symmetry establishes a type, asymmetry establishes specificity. Without asymmetry, form would remain abstract; through asymmetry, it becomes real.

This distinction between type and individuality is particularly important to comparative morphology. When biological, geological and cosmic forms are compared in this book, a complete correspondence cannot be expected. What can be compared are not details, but types of organisation. Radiality, for example, may be manifested in a flower, a nebula and an ornament, but the particular radial structure will differ in each case. Layering may be present in a bud, a stone and a cosmic shell, but the nature of the layers will be different. A spiral may occur in a plant, a flow and a galaxy, but its physical causes will not coincide. In each case, symmetry and asymmetry form a unique configuration.

Symmetry breaking is also associated with the emergence of an axis. As long as a system remains completely symmetrical, all directions may be equivalent. Development, however, requires one particular direction to be distinguished. In a plant, this may be the vertical direction of growth, the stem or the central vein. In an organism, it may be an axis of development. In geology, it may be a line of pressure, faulting, a valley or a ridge. In a cosmic structure, it may be the direction of rotation, ejection, polar organisation or the distribution of matter. In symbolic culture, it may be the world axis, the trunk of a tree, a staff, a column or the vertical line of a composition. An axis arises as an organised breaking of the equivalence of directions.

The emergence of an axis does not destroy wholeness, but gives it the capacity to develop. An axis connects levels, establishes orientation, separates sides and makes branching possible. Without an axis, a tree would not become a tree, a leaf would not acquire venation, a flower would lack the relationship between centre and unfolding, a landscape would have no directionality, and a symbolic composition would lack a vertical logic. The axis is therefore one of the first results of symmetry breaking. It demonstrates that the system has selected a direction of becoming.

Another result of symmetry breaking is the emergence of a centre. At first sight, a centre appears to be associated with symmetry, but in morphogenesis it often arises as a differentiated region distinct from its surroundings. A homogeneous medium has no centre because no position differs from any other. A centre appears when one region becomes distinctive: denser, more active, brighter, more highly stressed, more organisationally significant or more fundamental. Form begins to distribute itself around this centre. The centre may be geometrical, energetic, functional, compositional or symbolic. In every case, it is a point at which the equivalence of space has been broken.

Together, the centre and axis establish the basis for subsequent unfolding. The centre concentrates; the axis directs. The centre preserves the point of origin; the axis establishes development. The centre is associated with potentiality, the axis with actualisation. In a flower, the centre becomes the region around which the petals unfold. In a tree, the centre of growth is connected to the axis of the trunk. In a geological geological structure, a centre of pressure or faulting may organise lines of deformation. In a nebula, a luminous or dense region may determine the distribution of shells. In a bas-relief, a central sign and vertical axis may organise the composition. This relationship between centre and axis is one of the principal morphogenetic invariants.

Symmetry and symmetry breaking are also associated with layering. A layer arises as a difference within a whole. If a structure is entirely homogeneous, it contains no layers. A layer signifies either that the system developed in stages or that different zones exist within it. In a bud, layers of petals reveal stages of concealed organisation. In a stone, layers record a sequence of accumulation or internal processes. In rock, layering is associated with the history of deposition, pressure and deformation. In a nebula, shells may record stages of ejection or expansion. In sacred geometry, nested circles and levels may express a transition from the centre to the periphery. A layer is a trace of disrupted homogeneity.

Finally, symmetry breaking is associated with the edge. The edge of a form is almost always less symmetrical than its ideal centre. It is at the edge that interaction with the environment, resistance, growth, rupture and differentiation are manifested. The edge of a leaf may be serrated, undulating or dissected. The edge of a petal may curve, unfold or lose its regularity. The edge of a geological fold may fragment. The edge of a cloud or nebula may be scalloped and heterogeneous. Within the hypothesis of the Unified Matrix of the Universe, the active edge should be regarded as a zone in which symmetry is transformed into the living variability of form.

Symmetry breaking thus generates an entire system of morphological features: centre, axis, layer, edge, branching, radiality, spirality and individual asymmetry. These features do not exist independently of one another. They are connected within a process. First a difference appears; it is then amplified and begins to organise a direction; layers subsequently form; the structure then unfolds towards the periphery and stabilises as a form. This sequence is not a universal mechanical scheme applicable to every object, but it may serve as a morphogenetic model to be tested against different types of material.

The spiral occupies an important place here. It may be understood as a particular form that simultaneously breaks and preserves symmetry. It retains a connection with the centre but does not remain a closed circle. It repeats a movement, yet each turn occurs at a new distance from the centre. It unites cyclicality and development. This is why the spiral is so frequently perceived as an image of growth, time, unfolding, return and increasing complexity. Within the hypothesis of the Unified Matrix of the Universe, the spiral may be regarded as a transitional form between the circle and an unfolded multiple structure.

Radiality likewise arises through symmetry breaking, although at first sight it may appear to be an expression of symmetry. A radial form preserves the centre but already possesses directions. It is not simply enclosed within itself, but unfolds outwards. A flower, star, rosette, mandala, certain nebulae and ornaments display this principle. Radiality marks the moment at which the centre becomes the source of multiple directions. It is therefore not static symmetry, but a symmetry of unfolding.

Branching represents a more complex stage in the disruption of initial unity. A single line divides into several, and each of these may divide further. Branching preserves a connection with the original centre or axis, but unfolds the form into multiplicity. It is characteristic of trees, roots, vascular systems, neural networks, river basins, cracks, lightning and certain cosmic and cultural structures. Branching demonstrates that symmetry breaking need not constitute disintegration, but may instead provide a means of expanding the whole.

From this perspective, asymmetry is not a deficiency of form, but its vital principle. Even a non-living form created through physical processes bears asymmetry as a trace of its becoming. A stone containing lines, layers and inclusions is more informative than a perfectly smooth sphere because its history is visible. A geological fold interrupted by ruptures reveals the course of

deformation. A nebula with a heterogeneous edge reveals the dynamics of matter. Natural form is always historical, and history is almost always asymmetrical.

For philosophical understanding, this means that the perfection of form should not be equated with ideal regularity. In nature, perfection is more often manifested as the capacity to preserve wholeness through change. A flower is perfect not because every petal is mathematically identical, but because all its petals are integrated into a common structure of unfolding. A tree is perfect not because its branches are symmetrical, but because it preserves an axis, growth, the connection between root and crown, and the capacity to bear fruit. A landscape is expressive not because of the regularity of its lines, but because of the coherence of stresses, flows and time. Form lives in the union of order and deviation.

In scientific terms, this requires a nuanced analysis. It is not sufficient to seek only ideal symmetries in natural forms. The types of symmetry breaking must also be studied. Where is the centre located? Is it displaced? How does the axis run? Is radiality preserved? How are the layers distributed? Where does rupture occur? How does the edge change? Is the structure of the parts repeated? These questions are more important than a general impression of resemblance. They make it possible to move from an aesthetic perception of form to morphological diagnosis.

For the future testing of the hypothesis, a classification of types of symmetry breaking could be developed. It might distinguish, for example, axial disruption, radial disruption, spiral displacement, peripheral deformation, separation of layers, branching division, central condensation, rupture of an envelope, local protrusion and asymmetrical growth. Such a classification would make it possible to analyse images not intuitively, but according to a defined set of features. Symmetry and asymmetry would then become working parameters rather than general terms.

It is also important to recognise that symmetry breaking has different causes in different systems. In a living organism, it is associated with development, regulation, genetic and epigenetic processes, chemical gradients and tissue mechanics. In a crystal, it is associated with growth conditions and the internal structure of the substance. In geology, it is associated with pressure, stress, faulting and erosion. In the cosmos, it is associated with gravitational heterogeneities, rotation, shock waves and turbulence. In culture, it is associated with compositional decisions, symbolic meaning and tradition. Symmetry breaking is therefore a universal principle only at the morphological level, not a single mechanism in the physical sense.

This clarification protects the hypothesis from excessive generalisation. It cannot be claimed that all instances of symmetry breaking in the world constitute a single process. It can, however, be argued that the development of form in many systems is associated with a transition from a simpler symmetry to a more complex organisation through the emergence of differences. This proposition is broad enough to possess philosophical significance and sufficiently cautious to avoid conflict with the individual sciences.

In the context of the Unified Matrix of the Universe, symmetry and its breaking constitute one of the central mechanisms in the transition from potentiality to manifestation. The initial form as a ‘circle-seed’ contains the possibility of the whole. Symmetry breaking opens a direction of development. The emergence of a centre and an axis establishes structure. Layering and branching unfold differences. Radiality and spirality organise the propagation of form. The active edge records interaction with the environment. The new form becomes stable, but already contains the possibility of the next cycle.

Symmetry is therefore not the final aim of morphogenesis. It is an initial state, a memory of wholeness and a condition of order. Symmetry breaking is not merely destruction. It is the beginning of becoming, the source of individuality and a transition to a more complex organisation. In this union of symmetry and asymmetry, we may discern one of the principal mechanisms of self-organisation: form is born neither from absolute chaos nor from static order, but from the tension between them.

This conclusion is of particular significance to the hypothesis of the Unified Matrix of the Universe. If recurrent forms in nature and culture are indeed associated with universal morphogenetic invariants, symmetry and symmetry breaking occupy a central position among them. They explain why form simultaneously preserves a recognisable order and acquires individual expression. They demonstrate how concealed wholeness becomes an unfolded structure. They also prepare the way for the next question: how is self-organisation manifested not only in living, but also in non-living nature?

2.4. Self-Organisation in Living and Non-Living Nature

For a long time, self-organisation was regarded primarily as a property of living systems. This is understandable: it is life that most clearly demonstrates matter's capacity for growth, development, restoration, increasing complexity and the reproduction of form. A plant emerges from a seed, tissue from a cell, an organism from an embryonic structure, and an organ with its own architecture and function from a multitude of cells. Living nature appears to demonstrate for itself that form may arise from within, without being mechanically assembled by an external maker.

The modern understanding of self-organisation, however, is considerably broader. It demonstrates that the capacity for order to arise from a system's internal dynamics is not confined to life. Self-organising structures are found in physics, chemistry, geology, atmospheric processes, hydrodynamics, crystallisation, cosmology and even cultural forms, if culture is regarded as a particular means of organising human experience. This expansion is of fundamental importance to the hypothesis of the Unified Matrix of the Universe because it allows morphogenesis to be understood not only as biological development, but also as a more general process of form generation.

In living nature, self-organisation is manifested particularly fully because form is associated here with function, heredity, metabolism, regulation and reproduction. An organism is not a mechanical sum of cells. Cells interact, exchange signals, respond to chemical gradients, experience mechanical stresses, form tissues, and react to their spatial position and to the state of the whole. The resulting structure is not contained within any individual cell as a ready-made object, but arises through the coordinated activity of numerous elements.

Biological morphogenesis demonstrates that the development of living things cannot be reduced to a simple increase in size. The growth of a plant, the formation of a leaf, the opening of a flower, the development of a root, the formation of a vascular network and the branching of neural structures are all processes of differentiation. The system does not merely become larger; it becomes more differentiated, more organised and more functionally defined. A centre, axis, layers, boundaries, growth zones, branches, a periphery, a rhythm of repetition and relationships

between parts arise within it. Living forms therefore constitute essential material for identifying morphogenetic invariants.

Plant form is especially expressive. The seed, shoot, bud, leaf, flower, fruit and new seed form a natural sequence in which movement from a closed state to an unfolded structure and then to a new cycle becomes visible. The seed contains potential. The shoot establishes an axis. The leaf unfolds a surface and a network of veins. The bud preserves layered closedness. The flower reveals a centre, radiality and a periphery. The fruit returns the process to the seed, but at a new level. This sequence possesses not only biological but also philosophical and morphological significance: it demonstrates how form passes through the stages of potentiality, unfolding, differentiation, maturity and reproduction.

In an animal organism, self-organisation is manifested differently, but no less profoundly. The formation of the body is associated with the emergence of axes, symmetries, organs, tissues, blood vessels, neural networks, and skeletal and muscular structures. An organism maintains its form not because it was constructed once and then remains static, but because it is constantly sustained through processes of metabolism, renewal, regulation and feedback. Living form is a dynamic stability: it preserves itself through continuous change.

It is fundamentally important, however, that self-organisation does not disappear beyond the boundaries of life. Non-living nature also demonstrates the capacity to produce stable structures. Crystallisation is one of the most obvious examples. Under particular conditions, crystals possessing an ordered internal lattice and external geometry emerge from a solution, melt or gaseous phase. This form is not created by an external designer. It arises from the internal properties of the substance, environmental conditions, temperature, pressure, rate of growth and interactions between particles. A crystal demonstrates that matter is capable of structural ordering even outside biological life.

Waves and vortices provide another example. Water, air, plasma, gas and liquid media are capable of producing stable dynamic structures. A vortex possesses a centre, rotation, a boundary, a direction of movement and an internal organisation. A wave possesses rhythm, a front, amplitude, propagation and interaction with the environment. These forms are not living, but they possess a clearly defined structure. They arise from the movement of the medium itself and persist for as long as the relevant conditions are maintained. Here form exists as a process rather than as a solid object.

Geological systems provide another scale of self-organisation. The Earth's crust, rocks, landforms, river channels, cracks, folds, layered structures, minerals and stone textures are formed through prolonged processes of pressure, cooling, crystallisation, sedimentation, erosion, tectonic movement and destruction. These processes possess no biological purpose, but they create stable forms. A geological fold records the distribution of stress. A river network reflects the interaction of water, gradient, ground and time. A coastline reveals the continuous interaction between water and land. Rock strata preserve a sequence of geological events. Stone becomes a bearer of the history of form's becoming.

Within the hypothesis of the Unified Matrix of the Universe, geological forms are particularly important because they allow the concept of morphogenesis to be extended beyond organic growth. A stone does not grow like a plant, but it may record stages of an internal process: a core, layers, waves, cracks, a surface, a boundary and the emergence of the internal into the external. A landscape does not unfold like a flower, but it may display an axis, folding, branching, an active edge and layering. Geology reveals a slow, dense and materially weighty form of self-

organisation, in which time is measured not in days and seasons, but in thousands, millions and hundreds of millions of years.

Cosmic structures extend this problem still further. Nebulae, galaxies, stellar clouds, gas-and-dust shells, spiral arms, star-forming regions and large-scale distributions of matter demonstrate that self-organisation is possible on scales almost beyond human imagination. Gravity, rotation, radiation, magnetic fields, shock waves, gas dynamics, turbulence, expansion and the collapse of matter operate here. Yet the result of these processes is likewise form: centred, layered, spiral, radial, filamentary, shell-like or branching.

Cosmic form is, of course, not living form. A nebula is not a flower, a galaxy is not a shell, and a stellar cloud is not a tree. At the morphological level, however, similar principles of organisation may be identified within them: centre and periphery, rotation, spirality, ruptures, shells, layers, active edges, and regions of condensation and dispersion. It is this level of comparison that is important to the hypothesis. It does not erase the differences between biology and cosmology, but demonstrates that the self-organisation of matter may generate structural motifs recognisable at different scales.

Fractality occupies a special position. It occurs in both living and non-living nature. Tree branches, roots, blood vessels, bronchi, neural dendrites, ferns, corals, river networks, lightning, cracks, coastlines, mountainous relief and certain distributions of cosmic matter may exhibit self-similar organisation. Fractality demonstrates that a complex form may arise through the repetition of simple principles at different levels. This is one of the strongest arguments for the need for a common language with which to describe the morphology of nature.

In living systems, fractality is often associated with efficiency of distribution. Branching networks enable matter, energy, signals or flows to reach numerous points. In non-living nature, fractal structures may arise through faulting, erosion, electrical discharge, flows, crystallisation, diffusion or gravitational distribution. The mechanisms differ, but the result possesses a common morphological feature: the part repeats the principle of the whole, while the form retains its complexity when the scale changes. This is particularly important to the hypothesis of the Unified Matrix of the Universe because self-similarity constitutes one of the principal features of a universal morphogenetic logic.

The transition from living to non-living nature requires clarification of the concept of morphogenesis itself. In the narrow sense, morphogenesis refers to the biological development of the form of an organism. In a broader scientific and philosophical sense, however, form generation may be understood as the emergence of structure within any system. Biological morphogenesis then becomes a particular, exceptionally complex and highly developed instance of a more general problem: how does matter acquire form? How does a differentiated structure arise from a homogeneous or less organised state? How do a centre, axis, layer, edge, branching, rhythm and self-similarity emerge? How is form preserved, and how does it become the foundation of a new process?

This extension must not be arbitrary. Biological concepts cannot simply be transferred to geology or cosmology without altering their meaning. If we call a stone a ‘morphogenetic body’, it must be clearly understood that we are not referring to living growth, metabolism or heredity. What is meant is that the stone may record a process of form generation through pressure, layering, crystallisation, stress and time. If we speak of the ‘unfolding’ of a nebula, this does not signify biological blossoming. It signifies a transition from a dense or concealed structure to a more

extended, visible, shell-like or radial organisation. Such terminological caution is essential to the scientific reliability of the hypothesis.

In this respect, the hypothesis of the Unified Matrix of the Universe should employ the concept of self-organisation as a bridge between different fields. Self-organisation makes it possible to speak about living and non-living systems within a common language without identifying them with one another. It demonstrates that order may arise in different media: cellular tissue, a mineral, flowing water, rock, a gas cloud or a cultural composition. In every case, however, this order has its own mechanism. What is common is neither the substance nor the physical cause, but a structural possibility: under particular conditions, a system is capable of generating form through its internal dynamics.

Living nature is distinctive in that its self-organisation is associated with the reproduction and preservation of life. Biological form exists not only as structure, but also as a functional system. A leaf enables exchange and photosynthesis, a root provides anchorage and nourishment, vessels permit distribution, a flower enables reproduction, and a fruit protects and disperses seeds. Here form is integrated into the life cycle. It does not merely arise, but serves the continuation of the system. Biological form therefore demonstrates especially clearly the connection between morphogenesis, function and cyclicality.

Non-living nature possesses no biological function, but its forms may nevertheless be functional in a broad systemic sense. A channel directs the flow of water. A crystal maintains the internal order of a substance. A vortex organises the movement of a medium. A crack redistributes stress. A fold records the deformation of rocks. A cosmic shell reflects the dynamics of the ejection or expansion of matter. Function here is not associated with purpose, but with the role of form within a process. This allows us to speak of the structural function of form even beyond biology.

This approach removes an unnecessary opposition between the living and the non-living. Living systems, of course, possess qualities absent from non-living matter: metabolism, heredity, evolution, self-reproduction, regulation and adaptation. These distinctions cannot be erased. At the level of form generation, however, living and non-living systems may display similar organisational motifs. In both cases, form arises through the interaction of internal conditions and the external environment. In both cases, boundaries, flows, stresses, symmetry, symmetry breaking, self-similarity and stability are important. It is at this level that the hypothesis may seek universal invariants.

The domain of transitional analogies is particularly interesting. Branching, for example, occurs in plants, vascular systems, neural networks, river basins, lightning, cracks and the cultural image of the tree. In every case, it is associated with a transition from a single channel or centre to multiple directions. The causes, however, are different: tissue growth, fluid movement, electrical discharge, erosion, mechanical stress or symbolic composition. Branching does not therefore prove the existence of a single mechanism, but it does demonstrate the universality of a particular structural solution. Such a solution may be advantageous or natural for distributing flows, stresses, matter, energy or meaning.

The same applies to the spiral. Spirals occur in leaf arrangement, shells, vortices, cyclones, galaxies, ornaments and sacred geometry. They may arise through growth, rotation, flow, gravitational dynamics, compositional construction or symbolic thought. Morphologically, however, the spiral always unites repetition and development: the movement returns towards or around a centre, but does not remain at the same level. The spiral is therefore one of the most expressive invariants of self-organisation.

Radiality likewise unites living and non-living forms. A flower opens around a centre; a starfish possesses a radially organised body; crystals may possess radiating structures; impact processes create craters and diverging lines; nebulae form shells; and ornaments are constructed from the centre towards the periphery. Radiality demonstrates the propagation of form from a central region. It possesses its own mechanism in each case, but the general morphological principle remains comparable.

Layering is another important invariant. In living nature, it is visible in buds, fruits, tissues, tree bark, leaves and envelopes. In non-living nature, it occurs in sedimentary rocks, minerals, geological folds, ice structures, atmospheric layers and cosmic shells. A layer is always associated with time, boundaries and sequence. It demonstrates that form did not arise instantaneously, but developed in stages. Layering may therefore be regarded as the material memory of a process.

The centre and axis complete this set of fundamental features. The centre concentrates; the axis directs. These features occur in organisms, plants, crystals, vortices, geological structures, nebulae, galaxies, the World Tree, mandalas and ornaments. In living nature, they are associated with growth and function; in non-living nature, with the distribution of forces and matter; and in culture, with composition and meaning. What is important to the hypothesis is not to declare them identical, but to demonstrate that they constitute a stable language of form.

Cultural forms occupy a special position in this discussion. They do not represent the self-organisation of matter in the physical sense, but may result from the self-organisation of human experience and symbolic memory. When different cultures create images of the World Tree, circle, star, lotus, seed, axis, mandala or spiral, they record stable structures in the perception of the world. Culture selects, repeats and consolidates those forms that prove capable of generating meaning. In this sense, cultural form may be regarded as the symbolic self-organisation of observations of nature.

The cultural level must, however, be distinguished from the natural-scientific level. A crystal, leaf, nebula and bas-relief do not constitute evidence of the same type. A crystal can be studied physically and chemically; a leaf, biologically and morphometrically; a nebula, astrophysically; and a bas-relief, historically, culturally and hermeneutically. All of them may nevertheless be included in comparative morphology if they are analysed according to clearly defined features. This constitutes the methodological foundation of the later sections of the study.

Self-organisation in living and non-living nature demonstrates that the world is not divided into two incomparable domains: the domain of living form and the domain of formless matter. Non-living matter also possesses the capacity for structural organisation, although this capacity is realised differently. Living form possesses biological directionality and reproduction; non-living form records physical, chemical, geological or cosmic processes; cultural form expresses the semantic ordering of experience. There is no simple identity between them, but morphological comparison remains possible.

For the hypothesis of the Unified Matrix of the Universe, this means that universal morphogenetic order should be sought not in identical mechanisms, but in the recurrence of structural principles. If the concept is used rigorously, the Matrix should be understood as a meta-theoretical model of such principles. It does not replace biology, geology, physics or cosmology. It offers a common language in which centred organisation, axiality, unfolding, layering, branching, radiality, spirality, self-similarity and the staged development of form may be described.

It must nevertheless be remembered that the presence of self-organisation in different domains of nature does not automatically prove the existence of the Unified Matrix. It merely provides a basis for posing the question. Further research must determine whether the identified invariants recur consistently and whether they can be classified, measured, compared and modelled. Self-organisation is a scientific prerequisite of the hypothesis, but not its conclusive proof.

The chapter on self-organisation therefore has a preparatory function. It demonstrates that order may arise from non-equilibrium; that form is associated with fluctuations and symmetry breaking; that morphogenesis is a non-linear process; and that living and non-living systems may display similar structural motifs. This makes it possible to proceed to the next subject—morphogenesis as such: first in its biological sense, and subsequently in its expanded interdisciplinary meaning.

Self-organisation in living and non-living nature thus confirms the need for a common language of form generation. It demonstrates that matter, in different states and at different scales, is capable not only of existing, but also of organising itself; not only of changing, but also of creating stable forms; and not only of disintegrating, but also of generating new structures. It is within this broad field of self-organisation that the central question of the hypothesis of the Unified Matrix of the Universe arises: behind the diversity of these processes, is it possible to discern a recurrent morphogenetic logic connecting the biological, geological, cosmic, and cultural and symbolic dimensions of form?

Chapter Three

Morphogenesis: From Biology to a Universal Theory of Form

3.1. The Concept of Morphogenesis

The concept of morphogenesis occupies a central place in the present study. Whereas the first chapter examined form as a philosophical category, and the second considered it as the result of the self-organisation of complex systems, it is now necessary to turn to the process through which form itself arises. Morphogenesis is not merely the emergence of an object's external outline. Strictly understood, it is the process through which form emerges, develops, differentiates and stabilises, and through which a system acquires an internal structure, spatial organisation, functional specificity and the capacity to preserve its integrity under changing conditions.

The term 'morphogenesis' itself combines two semantic roots: form and origin. It cannot therefore be reduced to a description of a finished result. Morphogenesis always refers to becoming: how a form arises, the state from which it develops, the stages through which it passes, the forces and constraints involved in its formation, and why it stabilises in one particular configuration rather than another. The question of morphogenesis concerns not only what an object looks like, but also how it became possible.

In biology, morphogenesis is traditionally understood as the process through which the spatial organisation of a living organism is formed: its tissues, organs, body parts, systems, surfaces, axes and symmetries. A complex structure gradually emerges from a relatively simple initial state. Cells divide, move, specialise, and form layers, boundaries, cavities, protrusions, networks, organs and functional systems. Development is not, however, simply an accumulation of mass. The organism does not merely increase in size; it acquires form through successive differentiation.

For the present study, however, it is important to consider morphogenesis more broadly without becoming detached from its biological foundation. Biology provides the most obvious and scientifically developed example of morphogenesis. The problem of form generation itself, however, extends beyond the living organism. Nature contains numerous processes in which matter passes from a less organised state to a more clearly expressed structure: crystallisation, crack formation, the development of landforms, the folding of rocks, the formation of river networks, and the emergence of vortices, cloud structures, nebulae and galactic spirals. These processes are not biological morphogenesis in the narrow sense, but they belong to the more general problem of how form arises.

Within the hypothesis of the Unified Matrix of the Universe, morphogenesis should therefore be understood on two levels. The first is the specialised biological level: the formation of living structures within organisms and the plant world. The second is an extended morphological level: form generation as a universal process through which matter is organised in different media. Such an extension requires caution. Biological concepts cannot be transferred mechanically to

geology or cosmology. It is nevertheless possible to identify common structural features of processes in which a system acquires form: a centre, axis, layering, boundary, branching, radiality, spirality, self-similarity and staged development.

Morphogenesis begins when a difference appears within a system. As long as the state remains entirely homogeneous, form has not yet been manifested. For a structure to arise, a heterogeneity must emerge: centre and periphery, inner and outer zones, top and bottom, axis and lateral directions, dense and diffuse regions, active and passive areas, growth and constraint. This difference may arise for various reasons: a chemical gradient, mechanical stress, a local fluctuation, a change in density, symmetry breaking, an external influence or an internal process of self-organisation. In every case, however, difference becomes the first step towards form.

In this sense, morphogenesis is closely connected with symmetry breaking. The initial state may be relatively symmetrical, closed and potential. Development, however, requires departure from this symmetry. A seed must germinate, a bud must open, a mass of cells must differentiate, a flow must become organised, matter must be distributed, and pressure must find a line of deformation. Symmetry breaking is not merely destruction. It creates direction, establishes an axis, differentiates a centre, and makes branching and increasing complexity possible. Form is born when the equivalence of space ceases to be complete.

Morphogenesis encompasses several interconnected processes. First, there is the initiation of form—the emergence of an initial difference, centre, nucleus, axis or zone of activity. Second, there is the growth or propagation of the structure—the movement from the initial state towards a more extensively unfolded organisation. Third, there is differentiation—the formation of different parts, layers, directions, boundaries, modules and functions. Fourth, there is integration—the coordination of parts into a whole. Fifth, there is stabilisation—the consolidation of form as a stable structure. Without stabilisation, morphogenesis remains incomplete: an emerging pattern or form must persist for at least a particular period of time.

The stabilisation of form is especially important. Temporary configurations constantly arise in nature, but not all of them become forms in the strong sense of the term. A vortex may disappear, a crack may fail to develop, a cellular difference may be suppressed, a chemical pattern may disintegrate, and a cloud structure may disperse. An organisation becomes morphogenetically significant when it acquires relative stability. This stability may be solid, as in a crystal or stone; dynamic, as in a vortex or living organism; cyclical, as in a plant; or compositional, as in a cultural symbol. In every case, form must not only arise, but also sustain itself.

The stability of form does not, however, imply Immobility. A living organism preserves its form through continuous renewal. A river retains its channel even though the water within it is constantly changing. A cloud may maintain a stable outline for a period of time while its constituent matter remains in motion. A galactic structure preserves its overall pattern despite the movement of stars and gas. Morphogenesis is therefore not completed simply by the appearance of a static figure. It may continue through the maintenance of form, its reorganisation, adaptation, growth, disintegration or transition to a subsequent stage.

One of the most important characteristics of morphogenesis is its staged nature. Form rarely emerges immediately in a completed state. It passes through a succession of states. In biology, this is evident in the sequence of seed, shoot, leaf, bud, flower, fruit and new seed. In embryogenesis, the stages include cell division, establishment of axes, formation of layers, tissue differentiation and organ formation. In geology, staged development manifests itself differently: the accumulation of matter, pressure, deformation, layering, rupture and stabilisation

of landforms. In cosmic structures, it is possible to speak of the concentration of matter, condensation, rotation, ejection, expansion, shell formation and further evolution. In culture, symbolic form likewise passes through selection, consolidation, repetition and reinterpretation.

It is precisely this staged development that allows form to be regarded as a process. A finished form is only one moment within a longer chain of becoming. A flower cannot be understood without the bud and seed. A stone cannot be understood without the process of its formation. A landscape cannot be understood without time, pressure and erosion. A nebula cannot be understood without the preceding dynamics of matter. A symbol cannot be understood without the cultural experience that produced it. Morphogenesis therefore requires a historical perspective: every form has a past and contains the possibility of a future.

Within the hypothesis of the Unified Matrix of the Universe, staged development is expressed particularly clearly in the model of the transition from the ‘circle-seed’ to an unfolded, multilayered form. The initial form is understood as a potential wholeness. It is closed, concentrated and relatively symmetrical. Its equilibrium is then disturbed, a direction emerges and unfolding begins. The internal becomes external, concealed layers are manifested, the centre is connected to the periphery, and the form acquires an edge, branching, radiality or spirality. The completed structure may subsequently become the basis of a new cycle. This model should not be regarded as a ready-made scheme applicable to every object, but it may serve as an analytical framework for studying recurrent morphogenetic processes.

Morphogenesis is also connected with the concept of internal potential. No system develops arbitrarily; it develops within the limits of its possibilities. A seed cannot unfold into just any form: its development is constrained by its biological type, genetic information and environmental conditions. A crystal forms in accordance with the internal order of the substance. A landscape develops according to rock composition, pressure, water, climate and time. A cosmic cloud forms in accordance with the physical conditions of its environment. Potential is not a finished form, but it defines the field of what is possible. Morphogenesis is the actualisation of potential in a particular structure.

In this respect, form cannot be explained entirely by either internal or external causes alone. It arises at the intersection of internal potential and external conditions. A seed contains the possibility of a plant, but this possibility cannot be manifested without an environment. Rock possesses particular properties, but the form of a fold depends on pressure and time. A gas-and-dust cloud possesses mass and a distribution of matter, but its structure depends on gravity, radiation, rotation and external influences. A cultural symbol possesses a semantic tradition, but its form depends on material, technique, composition and historical context. Morphogenesis is always an event of interaction.

Form and environment cannot therefore be separated in morphogenesis. The environment does not merely surround the system; it participates in its becoming. The boundary between system and environment becomes an active zone. It is here that form encounters resistance, receives direction, experiences pressure, unfolds or is constrained. The edge of a leaf, the surface of a stone, a coastline, the boundary of a cloud, the contour of a nebula and the outer line of an ornament all reveal how internal organisation encounters external conditions. The edge of a form is often the most Informative region of morphogenesis.

Morphogenesis is also connected with function. In living systems, this is evident: the form of a leaf is associated with photosynthesis, the form of a root with nutrition and anchorage, the form of blood vessels with distribution, the form of a flower with reproduction, and the form of a neural

network with signal transmission. In non-living systems, however, it is also possible to speak of the structural function of form. A river channel directs the flow of water. A crack redistributes stress. A crystal maintains the order of a substance. A vortex organises the movement of a medium. A cosmic shell records the dynamics of expansion or ejection. Function here does not mean purpose in the biological sense, but the role of form within a process.

Morphogenesis is consequently always more than geometry. Geometry describes contour, proportion, symmetry, angle, curvature and repetition. Morphogenesis, however, explains why this geometry arose, how it is connected with a process, what role it performs and how it is maintained. The same geometrical scheme may have different causes. The spiral of a plant, a vortex and a galaxy does not represent one and the same physical process. These forms may nevertheless be compared if the structural function of spirality is analysed: rotation, growth, repetition, the relationship between centre and periphery, and development through displacement.

This approach helps to avoid a methodological error. The hypothesis of the Unified Matrix of the Universe must not be based on the superficial assertion that ‘different objects resemble one another and must therefore have a common cause’. A more precise formulation is as follows: ‘If different objects in different environments display similar morphogenetic features, it is necessary to investigate which common structural principles may underlie them.’ Morphogenesis provides a language for such research because it connects form, process, environment, stage, structure and function.

An important concept here is the morphogenetic invariant. An invariant is not an identical detail, but a recurrent principle of organisation. A centre, for example, may be manifested as the core of a flower, a nucleus of crystallisation, a zone of pressure, a gravitational concentration or the central sign of a symbolic composition. An axis may be a stem, a vein, a fault, a direction of flow, an axis of rotation or a world trunk. Layering may be petal-like, geological, atmospheric, cosmic or ornamental. Branching may be biological, hydrological, electrical, geological or symbolic. Morphogenesis makes it possible to study these features as functions in the becoming of form.

At the same time, a morphogenetic invariant does not eliminate differences between systems. The same invariant may be realised in different materials and through different mechanisms. This is particularly important to the scientific validity of the hypothesis. The Matrix must not be understood as a physically identical mechanism operating in the same way everywhere. It is more productive to understand it as a possible universal language of structural transitions: from homogeneity to difference, from centre to periphery, from symmetry to asymmetry, from closedness to unfolding, from simple to complex, from singularity to multiplicity, and from an individual form to a cycle of reproduction.

Morphogenesis is also associated with the memory of form. This expression requires caution, but it is useful as a philosophical and scientific metaphor. Form preserves traces of its becoming. In a living organism, these may include growth lines, tissue layers, the arrangement of organs and the structure of blood vessels. In a tree, they include growth rings, branching, scars and directions of growth. In a stone, they include layers, inclusions, cracks, waves and mineralogical patterns. In a landscape, they include valleys, folds, terraces and coastlines. In a nebula, they include shells, ruptures, filaments and regions of condensation. In a symbol, they include recurrent compositional elements conveying a stable scheme of the world. Form is an archive of process.

This memory is not always conscious or informational in the strict sense. A stone does not ‘remember’ as a living being does, but its structure preserves traces of events. A landscape

possesses no memory in the psychological sense, but it records the history of interactions among water, ice, wind and tectonic processes. A nebula does not remember, but its form bears traces of physical processes. ‘Memory of form’ should therefore be understood as a history of becoming preserved within structure. This concept will be important for the subsequent analysis of stones, landforms, artefacts and cultural images.

In biology, morphogenesis possesses another important dimension: reproduction. Form not only arises, but also transmits the possibility of a new form. A flower leads to a fruit, a fruit to a seed, and a seed to a new plant. An organism reproduces itself not as an exact copy of every detail, but as a type of organisation that permits variation. This allows the connection between morphogenesis and self-similarity to be understood: form repeats a principle without necessarily copying an external appearance. The type is preserved in each new cycle, but individuality also emerges.

This logic may be extended cautiously to a philosophical understanding of natural processes. Non-living nature possesses no biological reproduction, but cycles of structural transformation may exist: the destruction of rock and formation of sediment, sediment and a new stratum, a stratum and a new fold; stellar matter and new cosmic structures; crystallisation and destruction, dissolution and renewed crystallisation. These processes do not constitute a life cycle, but they demonstrate that one form may become the material of a subsequent form. A general motif emerges here: the completion of one state becomes a condition for new becoming.

Within the hypothesis of the Unified Matrix of the Universe, morphogenesis must be understood as the central connecting category. It unites the philosophical problem of form, the scientific problem of self-organisation, the biological problem of development and the comparative problem of invariants. Through the concept of morphogenesis, form can be discussed not as a static object, but as a process possessing a beginning, stages, internal differences, a relationship with the environment, stability and the possibility of subsequent transition.

A rigorous definition of morphogenesis for the present study may therefore be formulated as follows: morphogenesis is the process through which form emerges, develops, differentiates and stabilises within a system, and through which the internal potential of matter, interacting with the environment, energy, constraints and conditions, is realised in a particular spatial, structural and functional organisation. This definition is sufficiently broad to be applicable to different fields of form generation, yet sufficiently rigorous not to reduce morphogenesis to mere visual resemblance.

This understanding establishes the subsequent logic of the chapter. It is first necessary to consider biological morphogenesis as the most obvious and scientifically developed field of form generation. The discussion must then turn to Turing’s model, which demonstrates how patterns may emerge from a homogeneous medium through reaction–diffusion processes. This should be followed by consideration of the mechanical, chemical and bioelectric factors of form generation, which demonstrate that form depends on the interaction of multiple levels. Finally, it will become possible to pose the question of a transition from particular biological morphogenesis to a more general theory of form.

The concept of morphogenesis is therefore not auxiliary, but fundamental to the hypothesis of the Unified Matrix of the Universe. It is through this concept that it becomes possible to discuss the Matrix scientifically and philosophically as a model of form generation. If form is not an external shell but a mode of organising matter, then morphogenesis is the process through which this mode of organisation arises, unfolds and becomes established. In the subsequent study, it is

precisely morphogenesis that will enable a transition from individual images—the seed, flower, leaf, stone, landscape, nebula, tree and star—to the question of a universal logic in the becoming of form.

3.2. Biological Morphogenesis

Biological morphogenesis is the first and most obvious level at which the problem of form is revealed with maximum clarity. In living nature, form does not merely arise; it develops, is maintained, changes, performs functions and becomes incorporated into a reproductive cycle. Biological material is therefore of particular importance to the hypothesis of the Unified Matrix of the Universe. Here it is possible to observe what is often concealed, extended over vast periods of time or manifested less directly in other domains of nature: the transition from a potential state to a complex, multilayered and functionally organised structure.

In biology, form is never purely external. It is connected with the life of the system—with its metabolism, growth, regulation, adaptation, reproduction and interaction with the environment. The form of a leaf is associated with photosynthesis, transpiration and the distribution of flows. The form of a root is associated with anchoring the plant and absorbing substances. The form of a flower is associated with reproduction and the attraction of pollinators. The form of a vascular network is associated with the transport of liquids and substances. The form of a neural network is associated with signal transmission and coordination. The form of an embryo is associated with the successive becoming of the organism. Biological morphogenesis therefore demonstrates that form is not an adornment of the living body, but a mode of its existence.

Biological morphogenesis is founded upon a transition from relative simplicity to differentiated organisation. A living system does not become complex merely by increasing the amount of matter it contains. Growth alone does not yet create form. Differences must emerge during growth: some cells must become one kind of tissue and others another; some zones must become axes and others peripheral regions; some areas must become centres of activity and others boundaries; and some structures must assume the functions of nutrition, movement, protection, perception, reproduction or connection. Morphogenesis is not the accumulation of mass, but the formation of order.

At the cellular level, morphogenesis begins with differences in position, signals, stresses and interactions. The cells of a living organism do not exist as isolated units. They perceive chemical signals, respond to neighbouring cells, change shape, divide, move, adhere, form layers, arrange themselves into tissues and participate in the creation of an integrated structure. What is crucial is that the form of the organism is not contained within any one cell as a finished blueprint. It arises through the coordinated dynamics of many cells, each of which acts locally while together they produce a global order.

This property is particularly important to the hypothesis of the Unified Matrix of the Universe. The Matrix must not be understood as an external template mechanically imposed upon a living body. In biological morphogenesis, form arises from the interaction between the system's internal capacities and the conditions of its development. It is not created externally in a finished state, but unfolds from within through a succession of stages. Biology therefore provides the strongest material for understanding the 'circle-seed' and the subsequent unfolding of form: a living organism genuinely demonstrates how concealed potentiality becomes a manifested structure.

Embryonic development is one of the most profound examples of morphogenesis. At the beginning of development, the organism does not yet possess formed organs, tissues or a

definitive spatial architecture. Axes, polarities, layers and regions of future specialisation gradually arise within it. Homogeneity is disrupted, and this disruption becomes not destruction, but the beginning of organisation. Differences emerge between internal and external, anterior and posterior, upper and lower, left and right, and central and peripheral regions. These differences establish the future structure of the body.

Embryogenesis reveals especially clearly that form is born through the successive restriction of possibilities. At an early stage, a cell or group of cells may possess a broad developmental potential. This potential is then gradually specified: cells become specialised, enter particular tissues and participate in the formation of specific organs. This does not mean a simple loss of possibilities. On the contrary, determinacy arises precisely through restriction. To become part of the heart, neural tissue, skin or a blood vessel, a cell must enter a particular morphogenetic pathway. The development of form is always associated with selection.

In this sense, embryonic development confirms a general principle: form arises through the transition from the potential to the actual. A potential state contains many possibilities, but possesses no definitive structure. Actual form arises when these possibilities begin to unfold in a particular direction. This unfolding requires the breaking of initial symmetry, the emergence of axes, the formation of layers, cellular interactions, spatial signals and mechanical constraints. It is precisely this logic that underlies morphogenetic thought.

The development of tissues also demonstrates that biological form arises not only from chemical signals, but also from spatial organisation. A tissue is not merely a mass of cells. It is an ordered system in which cells possess positions, directions, connections, densities, boundaries and functions. Epithelial tissue forms surfaces and envelopes. Muscle tissue is organised according to the direction of contraction. Neural tissue forms networks for transmitting signals. Connective tissue provides support and connection and distributes mechanical stresses. Each tissue possesses a form corresponding to its role within the organism as a whole.

Organs arise as an even more complex level of morphogenesis. An organ is not an arbitrary collection of tissues. It possesses an architecture: an internal volume, surfaces, channels, layers, cavities, vessels, nerves, supporting structures and functional zones. The heart, lung, liver, kidney, brain, eye, leaf, root and flower are all morphologically organised systems. Their form is associated with the function they perform and the way in which they are integrated into the organism. Biological morphogenesis demonstrates that form and function are inseparable: form makes function possible, while function influences the consolidation of form.

Plant morphogenesis is of particular importance to the present study because plants provide the clearest images of unfolding, branching, layering, radiality and cyclicality. The seed, shoot, stem, leaf, bud, flower, fruit and new seed form a sequence in which morphogenesis is presented almost as an open book. This sequence displays all the principal elements of the hypothesis: a closed potential form, axial development, the unfolding of a surface, the formation of layers, the disclosure of a centre, the transition to multiplicity and the return to a new seed.

The seed is the initial morphogenetic structure. It is small, closed and often externally simple, but internally rich in the possibility of the future plant. A seed does not contain the adult plant as a finished miniature, but bears its potential. In this sense, the seed is the biological analogue of what the hypothesis designates as the ‘circle-seed’: a concentrated, closed and potentially complete form from which unfolding may begin. The seed demonstrates that form may exist before external manifestation—as a programme, possibility, direction and internal readiness for becoming.

The shoot marks the beginning of axial development. When a seed germinates, form leaves its state of concealed compactness. A direction appears: the root grows downwards, while the shoot reaches upwards. This is the first major disruption of the original closedness. The living system no longer remains a circle or grain; it acquires a vertical dimension, polarity and a relationship to earth and light. The axis becomes the foundation of subsequent growth. In this sense, the shoot demonstrates that morphogenesis begins not with ready-made complexity, but with the differentiation of a direction.

The leaf reveals another aspect of biological morphogenesis. It unfolds a surface, but this surface is not empty. It contains a central vein, lateral veins, a network of smaller conducting lines, an edge, a surface, asymmetries, rhythm, and a connection with the petiole and stem. The leaf demonstrates a transition from axis to surface, from line to network, and from centre to periphery. Its form is connected with the distribution of flows and interaction with the environment. Leaf veins do not merely decorate the surface; they are channels of nourishment, a supporting framework and a morphological memory of growth.

The edge of a leaf is particularly significant. It may be smooth, serrated, undulating, dissected, lobed, needle-like or scalloped. In every case, the edge reveals how the growing surface interacted with internal stresses and external conditions. The edge is a zone of active differentiation rather than merely the termination of form. This is why the active edge is regarded as an important morphogenetic invariant within the hypothesis of the Unified Matrix of the Universe. It demonstrates that form does not end in a passive line, but enters into contact with its environment.

The bud represents form before unfolding. It preserves layering, closedness, internal concentration and a concealed centre. Within the bud, the future flower already exists as a potential architecture, but this architecture has not yet been manifested. The petals are folded, compressed and overlapping, forming protective envelopes. The bud is one of the most precise biological images of the concealed Matrix: the form already exists, but has not yet unfolded. The connection between potentiality and future structure is especially clear within it.

The flower represents the moment of unfolding. The internal becomes external, the layers separate, the centre becomes visible, the petals form a radial or approximately radial structure, and the edge begins to perform an active visual and functional role. The flower demonstrates that morphogenesis involves not only growth, but also opening. Within it, an initially closed form passes into an open organisation. This is why the flower occupies a special place in the hypothesis of the Unified Matrix of the Universe: it is one of the clearest local models of the transition from seed to unfolded form.

The flower is not, however, the endpoint. After flowering, a fruit arises, and seeds form within the fruit. Morphogenesis is therefore cyclical. An unfolded form once again produces a closed potential structure. The flower leads to the fruit, the fruit to the seed, and the seed to a new plant. This sequence manifests a fundamental principle: the completion of one morphogenetic cycle becomes the beginning of the next. Form does not simply unfold and disappear; it returns itself to potentiality, but through a new level of organisation.

The vascular networks of living organisms provide another important example of biological morphogenesis. Blood vessels, the conducting tissues of plants, the bronchial tree, lymphatic networks and capillary systems are all distribution structures. Their form is associated with the need to deliver substances, gases, liquids or signals to numerous points. They therefore frequently possess a branching organisation. Large channels divide into smaller ones, which in

turn divide into still finer channels, and so forth. The principle of self-similarity is clearly manifested here: a part of the network reproduces the general type of organisation of the whole.

The branching of vascular systems demonstrates that form may constitute an optimal means of distributing a flow. Where a centre must be connected to numerous peripheral regions, a tree-like or reticular structure proves exceptionally effective. Branching is therefore not accidental. It arises as a response to the problem of distribution. This is important to the hypothesis because similar branching structures occur not only in biology, but also in river systems, cracks, lightning, roots, neural networks and cultural images of the tree. Biology provides the initial and most evident example of this morphogenetic invariant.

Neural networks represent an even more complex level of branching and connection. Neurons possess processes, dendrites, axons, connections and nodes of signal transmission. Their form is associated with the function of communication. The nervous system is not simply a collection of cells; it is a spatially organised network in which structure and function are inseparable. Here branching serves not to distribute liquid, but to transmit information. The morphological principle nevertheless remains comparable: lines of connection extend from a centre or cell body, creating a complex branching system.

These biological networks demonstrate that morphogenesis is associated not only with the creation of visible external forms, but also with the internal architecture of the organism. Form may be concealed, microscopic, functional or reticular. It is not always manifested as an external contour. Blood vessels, nerves, cellular connections, tissues, membranes, fibres and fields of stress are also forms. The hypothesis of the Unified Matrix of the Universe must therefore not be restricted to visually striking objects. Its subject is not only the visible beauty of form, but also its underlying organisation.

Biological morphogenesis also demonstrates the role of mechanics. Living tissues grow, stretch, compress and bend; they experience pressure from neighbouring structures, resistance from envelopes and stresses within cellular layers. The form of an organ or tissue depends not only on chemical signals, but also on its mechanical state. Folds, bends, tubes, cavities, protrusions and branching structures, for example, may arise through interactions between growth and mechanical constraints. This is important to the subsequent transition to mechanochemical models: form is produced not by one cause, but through the coordination of multiple levels.

Bioelectric processes may also participate in morphogenesis. Electrical potentials across cell membranes, fields of ionic flow and electrical communication between cells may influence the direction of growth, regeneration, tissue formation and the restoration of structure. This broadens the understanding of biological form. It depends not only on genes and chemistry, but also on spatial, mechanical, electrical and informational relationships. Understood in this way, the organism is a multilevel system in which form arises through the coordination of different kinds of processes.

Biological material is also particularly important because it demonstrates the relativity of causal levels. The form of an organism cannot be said to be determined entirely by genes alone. Genetic information is necessary, but it is realised within tissues, cells, the environment, mechanical conditions, chemical gradients and the temporal sequence of development. Nor can form be said to be determined entirely by the external environment. The environment exerts an influence, but it is a particular living system with its own internal potential that responds. Biological morphogenesis arises between the internal and the external, between programme and conditions, and between heredity and becoming.

For the hypothesis of the Unified Matrix of the Universe, this means that the Matrix cannot be understood as one single factor. If the Matrix is discussed in a biological context, it must refer to a structural logic that coordinates different levels. Form arises not because one element governs all the others, but because the system organises a multitude of interactions into an integrated process. The centre, axis, layers, branches, edges, fields and boundaries become not accidental features, but elements of this coordination.

Biological morphogenesis also demonstrates the principle of modularity. Many living forms are constructed from recurrent elements: leaves along a stem, petals within a flower, body segments, branches, vascular ramifications and cellular structures. Modularity allows repetition and diversity to be combined. The same principle may be reproduced many times, while each module occupies its own place within the system as a whole. The petals of a flower resemble one another, but are not completely identical. The branches of a tree follow a common principle, but differ in length, angle and direction. Neural branches form recurrent yet individual configurations. Modularity is one of the mechanisms of biological self-similarity.

The fractal organisation of living systems is closely connected with this principle. Tree branches, roots, blood vessels, bronchi, neural dendrites, ferns and corals frequently display repeated structures at different levels. Fractality enables a living system to fill space efficiently, distribute flows, increase surface area and connect the centre with the periphery. It demonstrates that complexity may arise through the repetition of a relatively simple principle. For the hypothesis of the Unified Matrix of the Universe, fractality constitutes one of the principal bridges between biology and the broader morphology of nature.

Biological morphogenesis must not, however, be idealised. Living forms are not flawlessly regular geometrical schemes. They contain deviations, asymmetries, damage, adaptive changes and individual variations. This is precisely what makes them real. The form of a living organism does not reproduce an abstract idea with mathematical precision; it develops within a particular environment and a particular history. When analysing biological forms, therefore, it is important to seek not ideal correspondences, but stable principles of organisation. A leaf may be slightly curved yet retain its axis and venation. A flower may possess dissimilar petals yet retain radiality. A tree may be asymmetrical yet retain its trunk, branching and connection with its roots.

This understanding is particularly useful for subsequent comparison with geological and cosmic forms. If form is not ideally regular even in biology, still less should perfect symmetry be expected in a landscape, stone or nebula. Real form always develops under conditions of resistance. Morphogenetic analysis must therefore treat variability as the norm. An invariant is manifested not in the absolute identity of details, but in the recurrence of a principle.

Biological morphogenesis may be regarded as the first evident level at which the logic that the hypothesis of the Unified Matrix of the Universe seeks to extend is manifested. Its principal elements are especially clear here: initial potentiality, symmetry breaking, axial development, layering, branching, radiality, unfolding, an active edge, self-similarity, stabilisation and reproduction. In a living organism, these elements are biological in nature. Their morphological significance, however, may be used as a point of departure for analysing other levels.

Biology must therefore occupy a central place in substantiating the hypothesis. It provides not merely a collection of beautiful forms, but real processes through which form is born from the internal organisation of a system. Biology demonstrates that form may simultaneously be structure, function, process, memory and future. A seed contains the future plant; the plant unfolds its structure; the flower reveals its centre; the fruit returns form to the seed; a network

distributes flows; tissue creates an organ; and the organ becomes integrated into the whole. All this makes biological morphogenesis the principal initial field for constructing a universal theory of form.

The analysis cannot, however, stop at this level. If the hypothesis were confined to biology, it would remain a theory of living morphogenesis. Its broader purpose is to ask whether some principles of biological form generation may possess analogues in non-living nature and the cosmos—not in the sense of transferring life directly to stones, landscapes or nebulae, but in the sense of comparing structural principles. To do this, it is first necessary to understand the mechanisms of biological morphogenesis already described by science. One of the most important of these is Alan Turing's reaction–diffusion model, to which the discussion must now turn.

3.3. The Turing Model

One of the most important scientific models for understanding how form may arise from a relatively homogeneous state is Alan Turing's reaction–diffusion model. Its significance extends far beyond any particular biological example. Turing demonstrated that spatial order can arise not only as a result of external influence or a predetermined blueprint, but also through the internal dynamics of a system in which chemical substances spreading at different rates interact. This model is particularly important to the hypothesis of the Unified Matrix of the Universe because it provides a rigorous scientific example of how structure may arise from homogeneity.

At the heart of the Turing model lies the question of how stable patterns appear within a developing system if its initial state was relatively uniform. In a biological context, this may concern spots on animal skin, stripes, segments, pigment distribution, organ primordia, recurrent structures and other spatial patterns. The deeper significance of the model, however, lies elsewhere: it demonstrates the very principle of the transition from symmetry to difference, from homogeneity to form, and from a potential state to an organised pattern.

Turing proposed that morphogenesis could be understood through interactions between chemical substances that he called morphogens. These substances can react with one another while simultaneously spreading through space by diffusion. The model is therefore known as a reaction–diffusion model. It involves two important processes: reaction—the local interaction of substances—and diffusion—their propagation into the surrounding region. When these processes are combined in a particular way, the system may lose its initial homogeneity and form a stable spatial pattern.

The best-known explanation of this model involves interactions between an activator and an inhibitor. The activator promotes the formation of a particular feature or local state. In other words, where the activator becomes more concentrated, it promotes a further increase in its own concentration or the development of a particular morphological region. The inhibitor, by contrast, suppresses this process. If the activator acts locally while the inhibitor spreads further and faster, an important effect arises: structure is amplified in one region while neighbouring regions are suppressed. The system thereby produces an alternation between active and inactive zones.

This logic may be expressed more simply: local activation is combined with long-range inhibition. It is precisely this combination that permits the emergence of spots, stripes, rings, waves, spirals

and other patterns. If the activator merely amplified itself without constraint, the structure might grow chaotically. If the inhibitor merely suppressed activity, no form would arise at all. Their interaction, however, creates a balance: some zones become centres of manifestation, while others remain inhibited, and spatial order emerges as a result.

It is fundamentally Important that such order arises without an external draughtsman. The system does not receive a finished pattern from outside. The pattern arises from internal relationships among substances, their rates of propagation, local activation, inhibition and boundary conditions. This is one of the strongest arguments for form being a result of self-organisation. In the Turing model, structure arises because the system itself becomes unstable with respect to small deviations. What begins as a fluctuation may be amplified and transformed into a stable pattern.

The concept of diffusion-driven instability is particularly important to the hypothesis of the Unified Matrix of the Universe. At first sight, diffusion should smooth out differences. If a substance spreads from an area of higher concentration to an area of lower concentration, the system should become more homogeneous. Under particular conditions in a reaction–diffusion system, however, diffusion may instead contribute to the emergence of differences. This appears paradoxical, but it is precisely here that the power of the Turing model lies: a process that would ordinarily eliminate heterogeneity may generate it when interacting with chemical reactions.

This produces a new view of morphogenesis. Form does not necessarily arise because a difference was already fully present in advance. Sometimes difference emerges from the dynamics of the system itself. Homogeneity proves unstable, and the system passes into a patterned state. Form may therefore constitute the system's internal response to its own condition. It appears not as an external instruction, but because the previous homogeneity can no longer be maintained.

In biological terms, the Turing model has helped to explain various kinds of natural pattern: spots, stripes, the periodic arrangement of structures, and certain aspects of tissue and organ development. It is important, however, not to reduce all biological form generation to this model alone. The morphogenesis of a living organism is far more complex. It involves genes, cellular interactions, mechanical stresses, electrical signals, tissue growth, environment and developmental history. The Turing model nevertheless demonstrates one fundamental mechanism: simple local rules can generate complex spatial order.

This proposition has enormous methodological significance. It demonstrates that a complex form does not always require a complex initial cause. A recurrent pattern may arise from a relatively simple interaction. Stripes, spots or spirals do not necessarily have to be 'drawn' in advance. They may emerge as the result of a dynamic process. This is important to the hypothesis of the Unified Matrix of the Universe because the proposed Matrix should not be understood as a completed external blueprint of every form. It is more appropriate to understand it as a structural logic within which simple principles are capable of generating a diversity of complex configurations.

The reaction–diffusion model also clearly demonstrates the connection between morphogenesis and symmetry breaking. The system's initial state may be homogeneous and symmetrical: substances are distributed uniformly, and no distinct pattern exists. Under certain conditions, this symmetry is then broken. Regions of higher and lower concentration, active and inhibited areas, and alternating spots or stripes emerge. This disruption does not constitute chaotic

disintegration. It creates a new order. The Turing model is therefore a scientific example of how symmetry breaking may become a source of form.

The Turing model also helps explain why recurrent structures so frequently arise in nature. If a system follows particular rules of local activation and inhibition, it may produce regular patterns. These patterns need not be perfect: they may be disrupted, displaced or variable. The general principle is nevertheless preserved. Spots and stripes in living nature are rarely absolutely identical, but they conform to a particular morphological logic. This corresponds closely to the broader idea that natural form unites order and variability.

Spiral and wave patterns are especially interesting. Under certain conditions, reaction–diffusion systems may produce not only spots and stripes, but also more complex structures: waves, rings, spirals and labyrinthine patterns. This is important to the hypothesis because spirality, radiality, layering and recurrence are among its key morphological invariants. The Turing model does not explain every spiral in nature, but it demonstrates that spiral or wave-like order can result from self-organising dynamics.

In philosophical terms, the Turing model helps to reconceptualise the relationship between the potential and the manifested. A pattern is not yet visible in the initial homogeneous system, but the possibility of its emergence is already contained within the system's parameters. When conditions change, this possibility becomes actual and form appears. This is closely related to the logic expressed through the image of the 'circle-seed' in the hypothesis of the Unified Matrix of the Universe: a potential wholeness contains the possibility of future unfolding, but the form itself becomes visible only through a process. This does not, of course, imply a complete identity between a biological seed and a mathematical model. The structural analogy is nevertheless significant: a concealed possibility becomes an explicit order.

The Turing model also demonstrates that morphogenesis can be described mathematically. This is fundamentally important to the scientific status of any hypothesis concerning form. If form remains merely an image, it is difficult to test. If the processes of form generation can be represented through equations, parameters, rates of propagation, thresholds of instability and conditions for pattern formation, rigorous analysis becomes possible. The hypothesis of the Unified Matrix of the Universe requires precisely this transition: from visual resemblance to modelling, and from a philosophical image to a testable structure.

The reaction–diffusion model cannot, of course, serve as a universal key to all forms in nature. It does not directly explain geological folds, crystals, galaxies, cultural symbols or every feature of biological development. Extending it without qualification to all objects would be a methodological error. Its significance in the present book does not lie in its explaining everything. It lies in its demonstration of a principle: order may arise through the interaction of simple processes within a system, and the disruption of homogeneity may lead to stable form.

In this respect, the Turing model is a scientific analogue of the more general morphogenetic question. If, within a chemical and biological medium, interactions between an activator and an inhibitor can create a pattern, we may ask whether other media possess their own pairs or systems of amplification and constraint. In geology, these might include pressure and material resistance, destruction and stabilisation, or erosion and rock hardness. In hydrodynamics, they might include flow and obstruction, velocity and viscosity, or movement and boundary. In the cosmic environment, they might include gravitational attraction and radiation pressure, condensation and expansion, or rotation and dispersion. In culture, they might include the semantic reinforcement of an image and the canon that constrains its variations. These

processes are not Turing mechanisms in the strict sense, but they may possess a similar organisational logic: form arises from the interaction of amplification and constraint.

This approach makes it possible to expand the significance of the Turing model without transferring it crudely into other fields. The argument is not that every form in the Universe is produced by a reaction–diffusion mechanism. The argument is that the Turing model demonstrates one possible scientific mechanism of self-organised morphogenesis, thereby confirming the possibility that form may arise from a system's internal dynamics. For the hypothesis of the Unified Matrix of the Universe, this constitutes an essential theoretical foundation.

It should also be noted that Turing patterns possess structural features relevant to the hypothesis: periodicity, the distribution of active zones, alternation, local concentration, boundaries between regions and the emergence of a pattern from homogeneity. These features may be compared with more general morphological invariants. A spot is associated with a centre of local activity. A stripe is associated with axial or linear organisation. A ring is associated with radiality and a boundary. A spiral is associated with rotational unfolding. A labyrinthine pattern is associated with a non-linear network and branching. The Turing model therefore provides not only a mechanism, but also a set of forms closely related to a universal language of morphogenesis.

Another important point is that reaction–diffusion patterns depend on the parameters of the system. Changes in reaction and diffusion rates, the relationship between activator and inhibitor, the size of the domain, initial conditions or boundaries may produce different patterns. This demonstrates that form is not determined by a single factor. It arises within a parameter space in which different conditions produce different outcomes. For the hypothesis, this means that a universal logic of form must not be understood as absolute invariability. The same general principle may produce spots, stripes, waves, spirals or mixed configurations, depending on the conditions.

This is especially important to understanding the diversity of natural forms. If different patterns can arise even in a relatively simple mathematical model, diversity is inevitable in real natural systems, where far more factors are involved. The hypothesis of the Unified Matrix of the Universe should therefore not seek literal correspondences between all objects. It should seek recurrent principles that permit multiple variants. The Turing model demonstrates that such variability is the norm in self-organised morphogenesis.

The reaction–diffusion model also emphasises the importance of scale. The same principle may be manifested in domains of different sizes, under different spatial constraints and in different proportions. A pattern depends on the geometry of the space in which it arises. This is important to the analysis of natural forms: form does not exist separately from the domain of its unfolding. A leaf, an animal's skin, a tissue, the surface of a stone, a field, a cloud and a cosmic shell all possess boundaries, dimensions and internal conditions. Morphogenesis is therefore always spatially specific.

Within the hypothesis of the Unified Matrix of the Universe, the Turing model helps to clarify the concept of the 'Matrix'. The Matrix should not be understood as a finished pattern. It may instead be understood as a set of conditions, relationships and rules under which a system is capable of generating a stable form. In the reaction–diffusion model, these conditions comprise reactions, diffusion, the relationship between activator and inhibitor, environmental parameters and boundaries. In the broader morphogenetic hypothesis, an analogous role may be played by the

centre, axis, gradient, constraint, symmetry breaking, layering, branching, self-similarity and staged development. The Matrix is not an image, but a logic of unfolding.

This understanding makes it possible to connect the Turing model with the philosophical concept of becoming. In its initial state, the system may be almost homogeneous. An instability then arises within it. Small differences are amplified. A pattern emerges and becomes stabilised. Form thereby becomes visible. This sequence possesses philosophical significance: concealed potential passes into a manifested structure through internal difference. It is precisely this transition that constitutes the core of morphogenesis.

It is important, however, not to overestimate the model's explanatory power. Biological forms are often produced by more than chemical patterns alone. Cells move, divide, change their mechanical properties, respond to electrical signals, interact with the extracellular matrix, and experience pressure, stretching and compression. Organs possess a three-dimensional architecture that cannot always be explained through planar reaction–diffusion patterns. The Turing model is therefore necessary but insufficient for understanding biological morphogenesis. It must be supplemented by mechanochemical, biomechanical, bioelectric and systemic approaches.

This supplementation is particularly important to the hypothesis of the Unified Matrix of the Universe. If form arises from interactions among many levels, the analysis cannot be restricted to a single model. The Turing mechanism demonstrates how a pattern may emerge. Real form, however, also requires mechanical embodiment, spatial stability, boundaries, stresses, growth, exchange and connection with the whole. The next step must therefore involve consideration of mechanochemical and bioelectric models, which demonstrate that morphogenesis is a multifactorial process.

The importance of the Turing model to the present study is nevertheless difficult to overstate. It provided the first rigorous mathematical language for understanding how form may arise from homogeneity. It connected morphogenesis with self-organisation, symmetry breaking, local interactions, diffusion and stable patterning. It demonstrated that simple rules can generate complex patterns. It made it possible to discuss form not as an external adornment, but as a result of the system's internal dynamics.

For the hypothesis of the Unified Matrix of the Universe, the Turing model provides a first-level scientific foundation. It does not prove the hypothesis as a whole, but it supports its central premise: form may arise through internal processes of self-organisation. If a homogeneous medium is capable of generating spots, stripes, spirals and other patterns, the question of a more general morphogenetic logic ceases to be fanciful and becomes scientifically admissible. The task that follows is to understand which other mechanisms participate in form generation and whether they can provide the basis for a broader theory of universal morphogenetic invariants.

3.4. Mechanochemical and Bioelectric Models

Turing's reaction–diffusion model demonstrated that spatial order may arise from chemical interactions and the diffusion of substances. The modern understanding of morphogenesis, however, is not confined to chemical patterns alone. The form of a living organism arises not in an abstract medium, but in real tissue possessing density, elasticity, stress, surfaces, resistance,

electrical properties, spatial boundaries and a mechanical history. Understanding biological form generation therefore requires consideration not only of chemical factors, but also of mechanical, mechanochemical, bioelectric and field-related ones.

This is of fundamental importance to the hypothesis of the Unified Matrix of the Universe. If form arises through the interaction of multiple levels of organisation, it cannot be explained by a single cause. The genetic programme, chemical signals, diffusion of substances, mechanical stresses, electrical potentials, environmental pressure, geometrical constraints and feedback do not operate in isolation, but within an integrated system. Morphogenesis becomes a multidimensional process in which matter does not merely receive form, but organises itself through the coordination of different kinds of interaction.

Mechanochemical models proceed from the premise that chemical processes and the mechanical properties of tissue influence one another. A chemical signal may alter cellular behaviour, causing cells to divide, move, contract or differentiate. The mechanical state of a tissue may, in turn, influence chemical reactions, the distribution of signals, the direction of growth and cellular activity. Tissue is not a passive medium through which substances spread. It participates actively in form generation: it stretches, compresses, bends, condenses, resists and reorganises itself.

Chemistry and mechanics are constantly interconnected within a living organism. Cellular growth places pressure on neighbouring cells. Pressure changes the form of a tissue. Changes in form alter the distribution of stresses. These stresses influence subsequent growth and differentiation. The result is a closed feedback loop in which a chemical signal becomes a mechanical change, while the mechanical change affects chemical and cellular activity. Such processes help explain the appearance of folds, bends, tubes, protrusions, cavities, branching structures and complex three-dimensional architectures.

A simple example can be seen in the formation of folded surfaces. When one tissue layer grows faster than another or experiences a different stress, it may begin to bend. This bending is not accidental. It arises from differences in growth rates, the resistance of neighbouring layers, the mechanical properties of the tissue and spatial constraints. A flat surface is thereby transformed into a folded, tubular or multilayered structure. This process demonstrates that mechanical stress may be no less important than chemical signalling in the generation of form.

Tissue mechanics is particularly important for understanding why living form possesses volume and architecture. The reaction–diffusion model is well suited to explaining patterns on surfaces or within distributions of substances, but an organ of a living organism is more than a pattern. It is a three-dimensional structure. It has thickness, elasticity, internal cavities, envelopes, channels, supporting elements, surfaces and boundaries. To explain such a form, it is necessary to consider how tissue folds, stretches, resists, bends and maintains spatial organisation.

In this sense, mechanochemical models bring us closer to a more complete understanding of morphogenesis. They demonstrate that form is not the result of pure information or pure chemistry. It is an embodied process. Information must pass through material. A chemical signal must be realised in tissue. Potential must become spatial structure. Morphogenesis is therefore always connected with the physical bearer of form. Matter does not merely execute a programme; it influences how that programme can be realised.

This idea is particularly important to the hypothesis of the Unified Matrix of the Universe. The Matrix cannot be understood as an abstract scheme existing independently of material. If a

universal logic of form generation exists, it is always manifested through a specific medium. In a plant, it is manifested through cells, tissues, water, turgor, light and growth. In a stone, through minerals, pressure, layers, cracks and crystallisation. In a landscape, through rocks, erosion, tectonics and gravity. In the cosmos, through gas, dust, fields, radiation and gravitational dynamics. In culture, through material, gesture, composition, symbol and tradition. If the same morphological logic does exist, it never manifests itself without a bearer.

Mechanical stress is one of the key factors in form generation. It may be internal or external, local or distributed, constant or temporary. In living tissue, stress arises through growth, cell division, movement, contraction, pressure from neighbouring structures, tension within envelopes, changes in volume and interaction with the extracellular environment. Stress does not simply deform an already completed form. It may participate in its creation. Where stress is distributed unevenly, axes, folds, growth zones, condensations, bends and boundaries arise.

Compression and tension are two fundamental mechanical states through which form acquires directionality. Compression may create folds, condensations, protrusions and bends. Tension may open a surface, extend an axis, expand a boundary or form a plane. These processes operate together in a bud, leaf, organ, tissue, vessel or embryo. Form does not simply ‘grow’; it redistributes stress. In this sense, biological unfolding always possesses a mechanical dimension.

Mechanics is particularly visible in the plant world. A leaf unfolds through tissue growth, turgor, the distribution of veins, the mechanical strength of its surface and interaction with the external environment. A bud holds its petals in a compressed state and then gradually opens them through changes in growth and stress. A stem preserves its vertical orientation by resisting gravity and wind. A root advances through soil by overcoming environmental resistance. Each form is the result of a mechanical dialogue between internal growth and external constraint.

In an animal organism, mechanics is manifested in the formation of tubular structures, cavities, folds, limbs, vessels, muscles and skeletal elements. Many organs, for example, develop through the bending and protrusion of tissues. Vascular networks form in relation to flows and distribution requirements. Neural structures develop within a space in which the direction of neurite growth depends on chemical, mechanical and electrical factors. The organism constructs itself not as a flat diagram, but as a complex spatial architecture.

The concept of *tensegrity*, or tensional integrity, is particularly important to understanding form as a system of distributed forces. In such a system, stability is achieved not through massive rigidity, but through a balance between compression and tension. Form is maintained because its elements are engaged in stressed interaction. In biology, this concept is applied to the cell, tissues and the organism as a whole. A cell is not a mere sac of matter; it possesses an internal framework, membranes, attachment points, stresses and connections. Its form depends on the distribution of forces. Tissue likewise maintains itself through a network of mechanical relationships.

Tensegrity is important to the hypothesis of the Unified Matrix of the Universe because it demonstrates that the integrity of form may be distributed. Form need not possess a single external centre of control. It may be maintained by a network of relationships. The centre, axis, edge, layer and branching structure operate not as separate details, but as elements of a system under tension. This permits the Matrix to be understood not as a rigid blueprint, but as a dynamic equilibrium of forces, directions and connections.

Mechanochemical processes also help explain how form may be simultaneously stable and mutable. Tissue can preserve its overall organisation while undergoing reorganisation. An organ may grow and change in size while maintaining its functional architecture. A plant may change form in response to light, wind, humidity or damage while retaining its species-specific type. Such plasticity would be impossible in a completely rigid system. Living form is stable precisely because it is dynamic. It sustains itself through the continuous redistribution of chemical and mechanical processes.

Bioelectric models add a further level. Living cells possess electrical properties. Their membranes maintain potential differences, ionic flows, electrical signals and fields. These phenomena have long been known in neurophysiology, but they are acquiring increasing significance in the understanding of morphogenesis. The electrical states of cells may participate in regulating growth, polarity, regeneration, differentiation and the spatial organisation of tissues.

Bioelectricity is important because it demonstrates that form may be coordinated not only through chemical substances and mechanical stresses, but also through electrical fields and potentials. Cells are capable of exchanging information not only molecularly, but also electrically. Potential differences may establish direction, define regions of activity, influence regeneration and participate in the spatial memory of the organism. This makes morphogenesis still more complex and multilevel.

The question of morphological memory is especially interesting. Some living systems are capable of restoring lost structures. Regeneration demonstrates that the organism somehow preserves a representation of its integral form. This representation should not be understood as a conscious image. It is more accurately conceived as a distributed system of signals, potentials, gradients, and mechanical and electrical relationships that establishes the normal architecture of the body. If part of the structure is damaged, the system may tend towards restoring the whole. Bioelectric models help explain how such spatial coordination may be possible.

This question is of considerable importance to the hypothesis of the Unified Matrix of the Universe. If the form of a living organism is maintained not only by local chemical reactions, but also by broader fields of coordination, the concept of the Matrix may acquire a more rigorous biological interpretation. In this case, the Matrix would not be a mystical scheme, but could be understood as a distributed system of morphogenetic relationships defining the integral organisation of form. This does not prove the existence of a universal Matrix in every domain of nature, but it demonstrates that in biology form may genuinely be associated with multilevel spatial coordination.

Bioelectric processes are also important to understanding boundaries and polarity. Different tissue regions may possess different electrical states. These differences may participate in the formation of axes, directions of growth, regions of regeneration and zones of differentiation. In this case, the electrical field becomes not merely an accompanying process, but one of the factors of morphogenetic organisation. It helps the system ‘determine’ the location of a centre, edge, injury, direction or boundary.

Caution is, of course, necessary here. Bioelectric models do not supersede genetics, chemistry or mechanics; they supplement them. It would be erroneous to claim that form is determined entirely by electrical fields. It would be equally erroneous to ignore their role. The modern understanding of morphogenesis is moving precisely towards a multifactorial view: genes, chemical signals, mechanical stresses, electrical potentials, fields, environment and

developmental history form a single network of causation. Form arises not at one level, but between levels.

This approach is close to the principle of biological relativity, according to which no single level can be identified as governing all the others. The genetic level is important, but it is not the only one. The cellular level is important, but likewise not the only one. Tissues, organs, the organism and the environment exert feedback upon lower levels. Causation within a living system is distributed. It operates from the bottom upwards and the top downwards, from the local to the global and from the whole to the part. This is particularly important to understanding integral form.

In the context of the hypothesis of the Unified Matrix of the Universe, distributed causation makes it possible to avoid crude reductionism. If form arises through interactions among levels, its source cannot be sought in only one element: a gene, molecule, cell, field or external influence. If the concept is used with scientific caution, the Matrix may be understood as the structural coordination of levels. It is manifested when different processes are assembled into an integral form.

Mechanochemical and bioelectric models also help provide a deeper understanding of the axis. The axis of a living form is not a simple geometrical line. It arises through the distribution of signals, stresses, polarities, flows and differences. In a plant, the growth axis is associated with the direction of light, gravity, hormonal gradients, mechanical support and the internal organisation of tissues. In an embryo, the bodily axes are associated with the spatial differentiation of cells and signals. During regeneration, an axis may be restored through a combination of chemical and electrical factors. The axis is therefore not only a visible direction, but also an underlying morphogenetic relationship.

The same may be said of the centre. The centre of a living form is not always a geometrically precise point. It may be a zone of activity, a growth region, a signalling node, a site of concentrated potential, a source of distribution or a compositional core. In a flower, the centre is associated with reproductive function and the organisation of petals. In an embryo, the centre may be associated with organising regions. In a cell, centred organisation may depend on the cytoskeleton, membranes and mechanical forces. The centre is a function of organisation, not merely a position in space.

The layer likewise acquires a new meaning. Layering in biology arises not only through the external superposition of parts, but also through tissue differentiation, growth mechanics, chemical gradients and spatial constraints. Embryonic germ layers, layers of skin, organ envelopes, petals within a bud, growth rings, membranes and tissues demonstrate that form frequently develops through the successive formation of levels. Each layer performs its own role, but all layers operate together. Layering becomes an expression of time and organisation.

The active edge of form likewise depends on mechanochemical and bioelectric processes. The edge of growing tissue may be a zone of cell division, tension, chemical signalling, electrical activity and interaction with the environment. The edge of a leaf, petal, wound, regenerating tissue or growing organ is the place at which form changes most actively. Attention to the edge within the hypothesis of the Unified Matrix of the Universe therefore possesses not only aesthetic but also scientific and morphogenetic significance. The edge shows where the system passes into a new state.

Branching likewise cannot be explained by a single factor. In plants, branching is associated with meristems, hormones, light, spatial constraints and growth mechanics. In the vascular system, it is associated with flows, signals, tissue requirements for nourishment and the distribution of pressure. In the nervous system, it is associated with chemical guidance signals, electrical activity, the mechanical growth of cellular processes and interactions with surrounding cells. In every case, branching is the result of coordination. It demonstrates how a system distributes itself in space.

Mechanochemical and bioelectric approaches are particularly important because they shift the discussion of form from the plane of visible results to that of concealed conditions. We see a flower, leaf, organ or network, but behind them lie fields of stress, gradients, potentials, constraints, feedback and mechanical relationships. This provides a deeper understanding of the very idea of the Matrix: visible form may be the manifestation of an invisible organisation. This invisible organisation, however, must not be understood mystically. It may constitute an entirely real system of physical, chemical, mechanical and electrical relationships.

It is here that the hypothesis of the Unified Matrix of the Universe acquires important scientific support. The author's idea of a concealed structure unfolding into visible form may be correlated with modern conceptions of morphogenesis as a multilevel process. The concealed is not necessarily mysterious. It may be a chemical gradient, mechanical stress, electrical potential, a field of interactions, a spatial constraint or a distributed memory of form. A visible structure arises when these invisible relationships become morphologically expressed.

It must nevertheless be remembered that biological models have their limits. The fact that mechanics and bioelectricity participate in the generation of living tissues does not mean that the same processes, in the same sense, operate in geology or cosmology. The logic of multifactorial morphogenesis may nevertheless possess methodological importance. In geology, form likewise depends on stresses, pressure, environmental composition and constraints. In the cosmos, it depends on gravity, radiation, density, rotation and fields. In culture, it depends on material, composition, canon and symbolic tension. The mechanisms differ, but the idea of form as the result of interactions among levels retains its significance.

Mechanochemical and bioelectric models thus expand our understanding of morphogenesis. They demonstrate that form arises neither from a chemical pattern alone, nor solely from a genetic programme, nor solely from an external force. It takes shape through interactions among matter, energy, signals, stresses, potentials, boundaries, environment and the whole. In living nature, this interaction is particularly complex and clearly expressed because it is associated with the development of tissues, organs, networks, axes, polarities and functions.

This conclusion is central to the hypothesis of the Unified Matrix of the Universe. If form constitutes a multilevel organisation, a universal theory of form must account not for a single mechanism, but for a general principle of coordination. The Matrix may be understood not as a simple scheme, but as a model of the coordination of different processes into a stable morphological structure. It is precisely this approach that permits a transition from particular biological models to the broader problem of universal morphogenesis.

3.5. From Particular Morphogenesis to Universal Morphogenesis

Biological morphogenesis is the most obvious and scientifically developed field in the study of form generation. It is in living systems that the process through which form arises is represented most fully: growth, development, tissue differentiation, organ formation, and the establishment of axes, layers, networks, boundaries, cycles and reproduction all occur here. The question posed in the present book, however, extends beyond biology. If morphogenesis is understood only as the development of a living organism, the hypothesis of the Unified Matrix of the Universe will remain within a biological theory of form. If morphogenesis is understood more broadly—as a process through which form emerges, unfolds, becomes structured and stabilises in different systems—it becomes possible to move towards the concept of universal morphogenesis.

This transition requires caution. Biological concepts cannot simply be transferred to stones, mountains, nebulae, galaxies or cultural symbols. A stone is not an organism. A mountainous landscape does not develop like an embryo. A nebula does not blossom. A galaxy does not grow like a plant. An ancient bas-relief is not a natural system of self-organisation in the physical sense. Universal morphogenesis must therefore not be understood as the direct identification of all processes of form generation. The issue is different: it concerns the possibility of identifying recurrent structural principles that are manifested in different media through different mechanisms.

This distinction between mechanism and principle is fundamental. The mechanisms may differ: biology involves cellular interactions, genetic regulation, chemical gradients, mechanical stresses, bioelectric fields and tissue dynamics. Geology involves pressure, temperature, crystallisation, tectonics, erosion, sedimentation, faulting and immense spans of time. In the cosmos, form is created by gravity, rotation, radiation, gas dynamics, turbulence, magnetic fields, shock waves, expansion and the collapse of matter. In culture, form is determined by symbol, material, technique, composition, tradition, mythological thought and visual experience. Despite these differences in mechanism, however, modes of structural organisation may recur: centred organisation, axiality, layering, radiality, branching, spirality, self-similarity, an active edge and staged unfolding.

The transition from particular to universal morphogenesis begins with the recognition that form is not only a biological problem. Any system that acquires a stable structure enters the domain of form generation. A crystal forms from matter passing into an internally ordered state. A stone preserves layers, lines, stresses and traces of formation. A landscape records the interaction of the Earth's surface with pressure, water, ice, wind, tectonics and time. A vortex organises a flow around a centre. A river network forms a branching system for distributing water. A nebula unfolds gas-and-dust matter into shells, filaments, edges and luminous structures. A galaxy may become organised around a centre and spiral arms. None of these cases involves life, but each involves the emergence of form.

Universal morphogenesis should therefore be understood as an extremely broad category of form generation encompassing transitions from a less clearly expressed, less differentiated or potential state to a more organised, differentiated, stable and structurally determinate form. This definition does not eliminate the differences between living and non-living systems. On the contrary, it makes it possible to perceive them against a shared background. Biological morphogenesis remains a special case associated with life, reproduction and heredity. Geological morphogenesis is associated with matter, pressure, time and landforms. Cosmic morphogenesis is associated with the distribution of matter on the largest scales. Cultural

morphogenesis is associated with the symbolic ordering of experience. All these domains may nevertheless be compared as different modes through which form arises.

The principal basis of such comparison is the recurrence of morphogenetic invariants. In a biological system, a centre may be a seed, a growth point, the core of a flower, a cell nucleus, a node in a vascular network or an organising region of an embryo. In a geological system, a centre may be manifested as a nucleus of crystallisation, a point of pressure, a dome, crater, fault zone or the origin of a spreading crack. In a cosmic system, a centre may be a region of gravitational concentration, the core of a nebula, the centre of a galaxy or a star-forming region. In a cultural system, a centre may be a compositional point, the sacred core of an image, the middle of a mandala, the germ of a symbol or the origin of an ornament. The material differs, but the function of the centre as a region of concentration and organisation recurs.

The same applies to the axis. In biology, an axis establishes the direction of plant growth, bodily orientation, the central vein of a leaf, the trunk of a tree or the polarity of an embryo. In geology, an axis may be the line of a fold, ridge, valley, fault or elongated stress. In a cosmic form, an axis may be manifested through the direction of rotation, ejection, polar structure or the symmetry of a shell. In culture, the trunk of the World Tree, a staff, column, compositional vertical or line connecting heaven, earth and the underworld becomes an axis. In every case, the axis is not merely a geometrical line, but a principle of directionality and connection between levels.

Layering likewise extends beyond biology. In a bud, it is expressed through folded petals; in a fruit, through envelopes; in an organism, through tissue layers; and in a tree, through growth rings. In geology, strata record sedimentation, pressure, folding and the internal history of rock. In cosmic structures, shells and waves may indicate stages of ejection, expansion or the distribution of matter. In sacred geometry, layering is manifested through nested circles, triangles, levels, zones and recurrent contours. Understood in this way, layering is not an embellishment of form, but a record of the sequence of its becoming.

Branching, radiality and spirality may likewise be regarded as universal morphological solutions. Branching unites singularity and multiplicity: roots, trees, blood vessels, nerves, river networks, lightning, cracks, ornaments and images of the World Tree all demonstrate different realisations of the same principle of distribution. Radiality demonstrates the propagation of form from centre to periphery: the flower, star, marine organism, crystal, crater, nebula, rose window and mandala. Spirality unites rotation, repetition and development: leaf arrangement, the shell, vortex, cyclone, galaxy, ornament and sacred diagram. In each case, the mechanisms differ, but the structural functions are comparable.

Fractality and self-similarity occupy a special place within this logic. They allow us to speak of the recurrence of form not only between different objects, but also within the system itself. The branch of a tree repeats the principle of the tree. A tributary repeats the principle of a river network. Small cracks may repeat the structure of larger faults. Leaf veins form a network in which larger and smaller levels are connected by a similar logic. Hierarchical structures may also be observed in cosmic distributions. Cultural ornaments are frequently constructed through the repetition of motifs at different scales. Self-similarity demonstrates that form may preserve its principle in transitions from whole to part and from part to whole.

It is here that it becomes possible to speak of the Matrix as a meta-theoretical model. Strictly understood, the Matrix should not be regarded as a material object concealed within every thing. It is not a physical lattice, mystical programme or external designer. Within a scientific and philosophical approach, the Matrix may be defined as a hypothetical structural logic of form

generation manifested through recurrent morphogenetic invariants. It exists not as an independent substance, but as a model describing how different systems arrive at similar structural solutions.

This understanding makes it possible to preserve scientific caution. Universal morphogenesis does not claim that all natural and cultural forms have a single physical cause. It proposes that different physical, biological, geological, cosmic and symbolic processes may display comparable structural schemes. It is precisely these schemes that become the object of investigation. Universality here is therefore not mechanical, but morphological. It concerns the form of organisation, not the identity of processes.

In this sense, biology serves as the initial but not the only level. It displays the clearest model of form's becoming: seed, shoot, axis, leaf, bud, flower, fruit and new seed. This sequence should not be transferred literally to geology or cosmology. It may, however, provide a language of stages: a closed state, the beginning of unfolding, the formation of an axis, layers and edges, a transition to multiplicity, the stabilisation of form and a new potential state. In geology, these stages may be manifested as a core, internal stress, layering, rupture, the emergence of a structure at the surface and stabilisation. In the cosmos, they may be manifested as the concentration of matter, condensation, rotation, ejection, shell formation, dispersion and renewed structuring. In culture, they may appear as the centre of a symbol, the axis of a composition, the unfolding of an ornament, the repetition of a motif and the consolidation of form.

What is important to universal morphogenesis is not the literal identity of stages, but the recurrence of transitions. The first transition is from homogeneity or closedness to difference. The second is from difference to direction. The third is from direction to structure. The fourth is from structure to multilevel organisation. The fifth is from multilevel organisation to stable form. The sixth is from completed form to new potential. These transitions possess different durations, material expressions and causes in different systems, but their logic may be comparable.

It is for this reason that the hypothesis of the Unified Matrix of the Universe introduces the A–B–C–D model. In its most general form, stage A may be understood as an initial potential wholeness: a seed, nucleus, circle, centre, closed form or compact state. Stage B may be understood as the beginning of unfolding: symmetry breaking, the emergence of an axis, a first crack, shoot, direction or polarity. Stage C may be understood as partial differentiation: layers, branches, petals, folds, waves, edges and internal articulation. Stage D may be understood as a relatively complete manifested structure: an open flower, a formed landscape, a stable network, a shell, a stellar or radial configuration, or a cultural composition. The completion of stage D may become a new A if the form enters a subsequent cycle.

This scheme should not become a dogma. It is a working model that must be tested against different materials. In some systems, the stages may be expressed clearly; in others, only partially; and in still others, they may not be identifiable at all. The purpose is not to force every object into the scheme, but to investigate where it genuinely helps to describe form generation. If the A–B–C–D model operates only in biology, its universality is limited. If it can be applied cautiously to geological, cosmic and cultural forms as an analytical scheme, the hypothesis acquires a broader foundation.

The transition from particular to universal morphogenesis requires the creation of a language of comparison. A flower and a nebula cannot be compared on the basis of impression alone. The following questions must be asked: Is there a centre? How is the axis expressed? Is layering present? How is the periphery organised? Are there indications of unfolding? Are elements

repeated? What is the character of the edge? Is self-similarity present? Can a stage of formation be identified? Is there a transition from a compact state to an unfolded one? Only such a set of questions can transform visual comparison into a research procedure.

The subsequent parts of the book will therefore require not only philosophical exposition, but also a methodology for image analysis. Each object must be considered according to defined parameters: system type, scale, the presence of a centre, axis, symmetry, asymmetry, layering, branching, radiality, spirality, edge complexity, degree of unfolding, possible A–B–C–D stage and level of evidential support. The hypothesis then ceases to be an arbitrary analogy and becomes a programme of comparative morphology.

Universal morphogenesis must also account for differences in temporal scale. In biology, a form may arise over hours, days, weeks, months or years. In geology, it may take thousands, millions or hundreds of millions of years. In the cosmos, it may develop over millions or billions of years, although individual processes may occur much more rapidly. In culture, a symbolic form may become established over centuries and millennia. The universality of morphogenesis therefore does not imply an identical rate. On the contrary, one important question concerns how similar structural principles manifest themselves at different tempos of matter.

Differences in scale concern not only time, but also space. Morphogenesis may occur at the level of a cell, tissue, organism, landscape, planet, stellar system, galaxy or cultural composition. Each scale possesses its own constraints. If self-similarity and fractality are indeed important natural principles, however, transitions between scales do not entirely eliminate the possibility of comparison. They require only a rigorous distinction: morphological similarity does not entail mechanical identity.

In this respect, universal morphogenesis may provide the foundation for a new morphological meta-theory. Such a theory would not replace the individual sciences. It must not explain biology in place of biology, geology in place of geology, or cosmology in place of cosmology. Its task is to distinguish a common level of form at which the findings of different sciences can be compared. Biology explains how a leaf forms. Geology explains how a folded landscape arises. Astrophysics explains how a nebula develops. A morphological meta-theory asks which structural features recur in these processes and why they prove stable.

This approach is particularly important in the context of modern science, which has accumulated an enormous quantity of visual data. Microscopy, satellite imagery, telescopic observations, digital terrain models, three-dimensional tissue reconstruction, computed tomography, astrophotography and image databases make it possible to compare forms at different levels with unprecedented precision. What was once perceived as a philosophical analogy can now be transferred into the domain of measurement: fractal dimension, edge curvature, symmetry, branching, density distribution, modular repetition and spectral image characteristics.

The hypothesis of the Unified Matrix of the Universe may therefore be developed as a research programme rather than merely as a worldview. Its testable component should be connected with the analysis of morphological invariants. BIO–GEO–COS databases may be created in which biological, geological and cosmic images are classified according to the same parameters. It is possible to test whether particular combinations of features recur more frequently than would be expected by chance. The fractal dimensions of objects, types of branching, character of radiality, edge structure and degree of layering may be compared. Computer vision and machine learning may be used to identify recurrent formal features.

At the same time, the philosophical component of the hypothesis remains necessary. It explains why the problem of form itself is meaningful. Science can measure a contour, but philosophy asks what the recurrence of contours and structures in different domains of matter means. Science can calculate fractal dimension, but philosophy raises the question of self-similarity as a mode of organising whole and part. Science can model patterns, but philosophy helps us to understand the transition from potentiality to manifestation. Universal morphogenesis must therefore be simultaneously a scientific and philosophical concept, but these levels must not be conflated.

Cultural and symbolic material occupies a special place within universal morphogenesis. Ancient images of the tree, circle, seed, flower, star, lotus, sacred geometry and cosmic axis do not constitute evidence of a natural law. They may, however, demonstrate that human consciousness has long recorded recurrent morphological principles. Culture perceived within nature not only individual objects, but also structural schemes: growth from a centre, verticality, branching, unfolding, cyclicality, the connection between earth and heaven, and return to the seed. Within a universal theory of form, this material may be considered as a hermeneutic layer—not experimental, but semantic.

Universal morphogenesis therefore encompasses three levels. The first is scientific and natural: actual processes of self-organisation and form generation in biology, physics, chemistry, geology and cosmology. The second is comparative and morphological: the identification of invariants across visual and structural series. The third is philosophical and hermeneutic: the interpretation of cultural symbols as possible records of the observed order of form. These levels must be connected without being conflated. It is precisely this distinction that allows the hypothesis to retain its scientific seriousness.

The transition to universal morphogenesis also requires the acknowledgement of limitations. Not every form is a manifestation of the proposed invariants. Not every resemblance is significant. Not every circle is a seed, not every spiral is evidence for the Matrix, and not every branching structure has the same nature. The hypothesis must be capable of saying not only ‘yes’, but also ‘no’: this object is suitable for analysis; this one is only partially suitable; this one is unsuitable; here the features are weakly expressed; here the resemblance is coincidental; here further verification is required. Without such limitations, a universal theory of form will become arbitrary interpretation.

The scientific strength of the hypothesis will depend on whether it can move from general images to operational criteria. If a centre is discussed, it is necessary to define how it is to be identified. If an axis is discussed, it is necessary to define how it is to be distinguished. If layering is discussed, it is necessary to determine which features of a layer are significant. If fractality is discussed, it is necessary to specify how it is measured. If a stage of unfolding is discussed, it is necessary to define the parameters by which it is identified. This transition from image to criterion is an essential condition of universal morphogenesis as a scientific programme.

In this sense, universal morphogenesis is not a finished answer, but a task. It must be constructed. Biological morphogenesis already possesses a developed scientific foundation. Geological and cosmic form generation are studied within their respective disciplines. Fractal geometry, synergetics, complex systems theory and modelling provide relevant tools. Bringing all this together within a common language of form, however, constitutes a separate research undertaking. The hypothesis of the Unified Matrix of the Universe proposes a direction for this work.

The substance of this transition may be expressed as follows: biology demonstrates that form can unfold from internal potential; physics and chemistry demonstrate that patterns can arise through self-organisation; geology demonstrates that non-living matter records prolonged processes of structuring; cosmology demonstrates that form arises at the largest scales of matter; and culture demonstrates that human consciousness symbolically preserves stable morphological schemes. If these domains are considered together, it becomes possible to speak of a more general logic of form generation.

It is precisely this logic that constitutes the core of the hypothesis of the Unified Matrix of the Universe. Here the Matrix is understood as the fundamental possibility that morphogenetic schemes may recur in different media. It is manifested not in all objects being identical, but in different objects passing through similar structural transitions: from centre to periphery, from closedness to unfolding, from symmetry to individual asymmetry, from layer to multilayered organisation, from line to branching, from circle to spiral, from singularity to multiplicity, and from completed form to a new beginning.

This understanding brings the chapter on morphogenesis to a close and prepares the next stage of the study. It has been demonstrated that morphogenesis is a process through which form arises and stabilises; that biological morphogenesis provides the clearest material for analysing the Matrix; that the Turing model demonstrates the possibility of patterns emerging from a homogeneous medium; and that mechanochemical and bioelectric models broaden our understanding of form generation as a multilevel process. It now becomes possible to turn to fractality and self-similarity as a language through which universal morphogenesis may be described more rigorously.

The path from particular to universal morphogenesis therefore proceeds not through arbitrary generalisation, but through a successive expansion of the question of form. Form is first studied within a living organism. It is then established that self-organising patterns are also possible within chemical and physical systems. It is subsequently recognised that non-living nature likewise creates stable structures. Cultural symbols then reveal the historical depth of human perception of these structures. This provides the basis for the study’s central proposition: the diversity of forms in nature, the cosmos and culture may be considered as a manifestation of recurrent morphogenetic invariants requiring further description, classification and testing.

Chapter Four

Fractality and Self-Similarity as the Language of the Matrix

4.1. The Fractal Geometry of Nature

Fractality is one of the most significant concepts for understanding natural form. It makes it possible to describe structures that long remained on the boundary between order and chaos: the branching of trees, the forms of clouds, the pattern of coastlines, the structure of ferns, vascular networks, mountainous relief, cracks, river basins, lightning, corals, the bronchial tree and certain cosmic structures. All these forms are difficult to describe in the language of classical geometry because they are neither straight lines, regular circles, smooth surfaces nor simple bodies. They are complex, irregular, multiscale and mutable, yet they are not disordered.

Classical geometry was long oriented towards ideal forms: the point, line, plane, circle, sphere, triangle, polygon and polyhedron. These forms are indispensable to mathematical thought and technical modelling, but real nature rarely conforms to them literally. A leaf does not possess a perfectly regular outline. A mountain ridge is not a smooth curve. A cloud does not have a simple surface. A tree is not constructed like a symmetrical architectural column. A coastline cannot be reduced precisely to a single smooth line. Nature seems constantly to deviate from ideal geometry, but this deviation does not signify the absence of order. It signifies the existence of a different kind of order.

Fractal geometry provided a language for describing this other order. Its fundamental feature is that it regards complex form not as a deviation from a regular figure, but as a regularity in its own right. A fractal structure exhibits recurrence at different scales. A part may reproduce the general principle of the whole without necessarily being an exact copy of it. A tree branch resembles the tree as a whole; a tributary repeats the logic of the river system; a small section of coastline retains the irregularity characteristic of a larger section; and the smaller segments of a fern frond repeat the structure of the entire frond.

Fractality therefore has particular significance for the hypothesis of the Unified Matrix of the Universe. If a part is capable of reproducing the general principle of the whole, form ceases to be merely the external outline of an individual object. It becomes a mode of organisation that may recur at different levels. In this sense, fractality provides a scientific and morphological language for describing one of the principal features of the Matrix—the self-similar unfolding of form.

Self-similarity should not be understood simplistically. In real nature, a part is rarely an exact reduced copy of the whole. Natural fractals differ from ideal mathematical fractals. In mathematics, it is possible to construct a figure in which the same element is repeated rigorously, infinitely and according to an exact rule. Such absolute recurrence is almost entirely absent from nature. Natural self-similarity is approximate, variable, limited in scale and dependent on material, environment, growth, pressure, time and chance deviations. It is precisely this, however, that makes it especially important: natural fractality unites regularity and individuality.

Fractal form demonstrates that nature frequently operates not by creating identical details, but by repeating a principle. In a tree, each branch is not an exact copy of the trunk, but it repeats the general mode of branching. In a vascular system, each new level of ramification is not identical to the preceding one, but it preserves the principle of flow distribution. Small folds in mountainous relief are not equal to larger ones, but may repeat their general logic. Every curve in a coastline is unique, yet the general irregularity persists as the scale changes. Fractality therefore makes it possible to understand form as a variable repetition of order.

This is particularly important when criticising a superficial understanding of resemblance. The hypothesis of the Unified Matrix of the Universe must not claim that all natural objects resemble one another externally. Such an assertion would be weak and easily challenged. A more rigorous question must be posed: can different objects reproduce a similar principle of organisation? Fractality shifts the analysis from external resemblance to structural recurrence. What matters is not that a leaf 'resembles' a tree, but that the logic of branching and distribution may recur in a leaf, tree, vascular network and river basin.

The fractal geometry of nature demonstrates that complexity may arise from relatively simple rules. If a particular process is repeated many times with changes in scale, direction, conditions or parameters, it is capable of generating a highly complex structure. Branching, division, expansion, bending, folding, faulting, repetition of an edge and distribution of a flow may all create forms that appear infinitely complex but possess an internal regularity. This is a crucial argument against the conception of natural complexity as pure chaos.

In this sense, fractality is connected with self-organisation. A self-organising system need not construct form according to a single external plan. It may create structure through the repetition of local interactions. Each branch of a tree grows under particular conditions of light, space, gravity and the plant's internal organisation. Yet numerous local acts of growth create an integrated crown. Every drop of water in a river system moves along a local gradient, but together these movements create the overall pattern of a drainage basin. Each crack propagates according to local stresses, but the collection of cracks may form a fractal network. The whole arises through the repetition of local rules.

Fractality is also associated with the efficiency of natural structures. In living systems, branching and self-similar forms often make it possible to use space to the fullest, increase surface area and distribute matter, energy or signals. The lungs possess a bronchial tree because gas exchange requires an enormous surface area within a limited volume. The circulatory system branches in order to deliver blood to tissues. Plant roots branch to reach a larger volume of soil. Leaf veins distribute water and nutrients across the leaf surface. In such cases, fractality is not only a form, but also a functional solution.

Fractality in non-living nature has different foundations, but is likewise associated with distribution, stress and scale. A river network arises through the movement of water over a surface, with every tributary incorporated into a larger drainage system. A coastline forms through interactions among water, land, rock, waves, climate and time. Mountainous relief preserves folds, faults and contours at different scales. Cracks in stone or drying soil may branch as they reflect the distribution of stress. Volcanic structures may display radial and branching forms of flow. Here fractality is not associated with a living function, but expresses the dynamics of matter and environment.

Natural fractality is especially important because it unites geometry and history. A fractal structure rarely arises instantaneously. It results from a process: growth, destruction, flow

distribution, branching, crystallisation, erosion, pressure, expansion or repeated influence. Fractal form therefore bears the memory of its becoming. Tree branches reveal the history of growth. A river network reveals the history of drainage and erosion. A mountain surface reveals the history of folding and destruction. Stone texture may preserve traces of crystallisation, pressure and crack formation. Fractality is therefore not only a spatial but also a temporal property of form.

In the context of the hypothesis of the Unified Matrix of the Universe, this makes it possible to speak of fractality as a language of unfolding. If form develops from a centre, axis, seed, nucleus or initial state, subsequent increases in complexity frequently occur through the repetition of structural steps. A branch produces branches, a layer produces new layers, an edge is subdivided into smaller edges, a crack generates a network, a flow creates tributaries, and a spiral continues its own movement. Form does not merely expand; it reproduces its logic at new levels.

Fractality also helps to explain the relationship between part and whole. In a mechanical object, a part may simply be an element performing an assigned function within a construction. In a fractal structure, the part bears an image of the principle of the whole. This does not mean that the part is fully identical to the whole, but it contains its organisational logic. A small fragment of a fern demonstrates the structural principle of the entire frond. A tributary demonstrates the logic of the river basin. A branch demonstrates the tree's mode of growth. In this sense, fractality is one of the strongest expressions of the concept of a morphological invariant.

This is of fundamental importance to the hypothesis of the Matrix. If the Matrix is understood as a universal logic of form generation, it must be manifested not only in large, integral structures, but also in their parts. In other words, the Matrix must be scalable. It must make it possible to perceive how a general principle recurs in particular forms and how a particular form retains its connection with the whole. Fractality provides precisely such a language: a language of recurrence across scales, in which form does not disappear in the transition from the large to the small, but changes while retaining structural recognisability.

Excessive extension must, however, be avoided. Not every recurrence is fractality. Not every resemblance between parts constitutes self-similarity. Not every complex form is a fractal. In scientific terms, fractality requires particular features: recurrence of structure at different scales, a complex hierarchy of elements, scale dependence and, in some cases, the possibility of measuring fractal dimension. The concept of fractality must therefore be used cautiously in this book. Where rigorous mathematical analysis is involved, methods of measurement must be applied. Where the discussion concerns visual analogy, it is more appropriate to speak of fractal-like or self-similar organisation.

This distinction is particularly important to the scientific defence of the hypothesis. Fractality must not become a decorative term applied to every beautiful and complex form. If everything is described as fractal, the concept will lose its meaning. Rigorous fractal structure, approximate natural self-similarity and simple visual complexity must therefore be distinguished. Rigorous fractality can be investigated mathematically. Natural self-similarity can be described morphologically and measured to some extent. Visual complexity may provide grounds for analysis, but does not constitute evidence.

Fractal dimension is one possible instrument of such analysis. Unlike ordinary geometrical dimension, it makes it possible to describe objects that occupy space in a manner more complex than a line but less completely than a surface, or more complexly than a surface but not as a volume. A coastline, for example, may possess a fractal dimension between that of a straight line

and a plane because it is irregular and reveals increasing complexity under magnification. Branching networks, cracks, cloud contours, vascular structures and landforms may likewise be analysed using similar parameters. For the hypothesis, this opens a path from visual impression to quantitative description.

Fractal dimension must not, however, be understood as the sole criterion. A form may possess morphological significance without exhibiting rigorous fractality. The centre, axis, radiality, layering, unfolding, spirality and active edge are also important. Fractality is one invariant, but it does not replace all the others. Within the Matrix as a hypothetical model of form generation, fractality must be considered together with other features. It demonstrates recurrence across scales, but does not by itself explain the entire process of morphogenesis.

The relationship between fractality and staged development is particularly significant. A self-similar structure often arises not at once, but through the successive repetition of a particular action: branch after branch, layer after layer, crack after crack, tributary after tributary, contour after contour. This means that fractality is the result of a process. It is not merely ‘present’ within a form, but is created over time. In this sense, fractality is more closely connected with morphogenesis than may initially appear: it demonstrates how development repeats its own principle and thereby generates complexity.

Within the hypothesis of the Unified Matrix of the Universe, fractality may be connected with the model of ‘leaf-like unfolding’. The leaf is one of the most expressive forms in which a surface, axis, venation, edge and network are combined within an integrated structure. The central vein establishes direction; the lateral veins create branching; the smaller veins form a network; and the edge records the interaction between growth and environment. Different levels of venation may reproduce the general principle of distribution. The leaf becomes not only a biological object, but also a morphological model of self-similar unfolding.

The fern is even more illustrative in this respect. Its large frond consists of smaller segments that repeat its general principle of form. Each level appears to unfold the same motif at a smaller scale. The fern is therefore frequently used as a classic image of natural fractality. It is important to remember, however, that a real fern is not an ideal mathematical fractal. It is living, variable and constrained by growth and environment. This is precisely what makes it especially valuable: it demonstrates not abstract recurrence, but living fractality, in which order coexists with deviation.

In vascular and neural networks, fractality performs a functional role. The system must connect centre and periphery, large and small channels, general flows and local regions. It therefore constructs a hierarchical network. Within such a network, each level is connected to those preceding and following it. This is not random branching, but a spatial logic of distribution. Within the hypothesis of the Matrix, such networks help to demonstrate that self-similarity may be not only visual, but also functional: the repetition of form is connected with the task of the whole.

In geology, fractality is particularly evident in river networks and coastlines. A river system forms a hierarchy: small streams flow into larger streams, these into rivers, and rivers into principal channels. This structure resembles the branching of roots or blood vessels, although its mechanism is entirely different. A coastline retains its irregularity at different scales: a large gulf may contain smaller bays, which in turn contain still smaller curves. Mountainous relief may display recurrent folds, scarps, valleys and lines of destruction. All this demonstrates that non-living nature may likewise possess self-similar organisation.

In the cosmos, the question of fractality is more complex and requires particular caution. Observable structures—nebulae, stellar clouds, galactic arms and distributions of matter—may possess filamentary, spiral, cloud-like, clustered or shell-like organisation. Some display indications of multiscale heterogeneity and self-similarity. Cosmic scales, however, require specialised astrophysical methods of analysis. Cosmic fractality should therefore be considered in this book not as obvious evidence for the Matrix, but as a possible level of comparison requiring rigorous verification.

Fractality is also important because it dissolves the rigid boundary between the simple and the complex. A complex form may arise from a simple rule applied repeatedly under different conditions. This corresponds closely to the hypothesis of the Unified Matrix of the Universe, according to which the diversity of forms may be a manifestation of a limited number of morphogenetic principles. The centre, axis, branching, layer, edge, spiral, radiality and self-similarity may be combined, repeated and scaled to create the enormous diversity of natural and cultural structures.

Fractality must not, however, be understood as a universal explanation of everything. It is one language of the Matrix, but not the Matrix in its entirety. In some forms, symmetry is more important than self-similarity. In others, the axis is fundamental. In still others, layering or radiality predominates. Some forms may produce weak results under fractal analysis. The purpose of this chapter is therefore not to declare the whole of nature fractal, but to demonstrate that fractality constitutes one of the stable principles through which nature organises complexity.

At the scientific and philosophical level, fractality makes it possible to reconsider the question of wholeness. If a part repeats the principle of the whole, the whole does not merely consist of parts, but transmits its organisational logic to them. This does not necessarily imply a mystical unity. It may mean that a process of growth, branching or distribution operates similarly at different levels. Philosophically, however, this is extremely important: form proves to be not a local and coincidental outline, but an expression of recurrent order. The part becomes a bearer of the principle of the whole.

This perspective helps to explain why fractality may be perceived by human beings as an especially compelling natural form. What we see in it is not mechanical repetition, but living regularity. A tree appears integral even though each branch is unique. A fern appears ordered even though its details vary. A landscape appears complex but not random. A cloud lacks a rigid form yet retains a characteristic structure. Fractality allows nature to be perceived as a system in which order and freedom do not exclude one another.

This idea is central to the hypothesis of the Unified Matrix of the Universe. The Matrix should not produce identical forms. It should explain why forms can differ while remaining structurally related. Fractality provides precisely such a mechanism of understanding: a general principle recurs, but each level and each object realises it in its own way. Self-similarity is therefore a language not of uniformity, but of organised diversity.

The fractal geometry of nature thus demonstrates that complex natural forms may possess internal recurrence, multiscale organisation and structural memory. It makes it possible to describe leaves, trees, vascular networks, river basins, landforms, coastlines, clouds, cracks and certain cosmic structures as objects in which a part reproduces the general principle of the whole. For the hypothesis of the Unified Matrix of the Universe, fractality becomes one of the most important invariants, enabling a transition from external resemblance to a more rigorous understanding of organisational recurrence.

The subsequent sections of the chapter will therefore examine self-similarity in living systems, geology and the cosmos. It is necessary to demonstrate how the fractal principle is manifested in different media, the limitations governing its application, and why fractality within the hypothesis of the Matrix should be understood not as a decorative analogy, but as the recurrence of a structural principle at different scales.

4.2. Self-Similarity in Living Systems

Living systems provide the clearest domain in which self-similarity is manifested. Within them, the recurrence of form is not an abstract geometrical feature: it is associated with growth, function, the distribution of matter, signal transmission, the stability of the organism and its interaction with the environment. Biological self-similarity is therefore of particular importance to the hypothesis of the Unified Matrix of the Universe. At this level, it is possible to observe how a part genuinely reproduces the general principle of the whole, and how form develops not through the random accumulation of details, but through the repetition of structural rules at different scales.

In living nature, self-similarity is rarely absolutely exact. A leaf is not a mathematically perfect copy of a tree, and a branch does not reproduce the trunk with geometrical precision. The general organisational principle is nevertheless preserved. A tree branch divides into smaller branches, those into still smaller ones, after which leaves, veins, secondary veins and networks of small conducting lines appear. At every level, the transition from a principal direction to lateral ramifications, from centre or axis to periphery, and from larger structure to smaller structure is preserved. This recurrence is not mechanical, but it is morphologically stable.

Self-similarity in living systems demonstrates that an organism is constructed not as a random collection of elements, but as a multilevel structure. The same organisational principles may recur in different parts of an organism: branching, layering, radiality, spirality, network distribution, axial organisation and modularity. These principles do not merely embellish living form. They enable it to function. A living system must grow, feed, breathe, transmit substances and signals, respond to its environment, regenerate and reproduce. The recurrence of form in biology therefore frequently possesses functional significance.

One of the simplest and at the same time most profound examples is the leaf. At first sight, a leaf may be described as a flat plant organ with a particular outline. Morphologically, however, it is considerably more complex. It possesses a central vein, lateral veins, a network of smaller conducting lines, an edge, surface, base and apex, and a connection with the stem. The larger veins repeat a general principle of distribution: lateral directions extend from the central axis, smaller branches extend from these, and still finer ones follow. The leaf is a surface within which a network has unfolded.

This network is not accidental. It distributes water, minerals, products of photosynthesis and mechanical support. Leaf veins are simultaneously channels, a supporting framework and traces of growth. Their arrangement demonstrates that the form of the leaf is organised from within. If the leaf is regarded as a model, almost all the key features of a morphogenetic structure may be distinguished within it: an axis, lateral branching, a periphery, an active edge, a network, self-similarity and the connection between part and whole. This is why the leaf may be regarded as one of the fundamental biological models of the Matrix.

It is especially important that a leaf is not merely a flat surface. Its form is associated with a process of unfolding. A young leaf is frequently folded, rolled or compressed. It then opens, extends its surface, develops its venation, forms an edge and enters into active interaction with light and air. Here it is possible to observe the transition from a compact state to an unfolded structure. Within this transition, self-similarity is manifested as a means of organising the surface: the leaf does not merely increase in size, but creates an internal network that repeats the principle of distribution at different levels.

The fern provides an even more expressive example of natural self-similarity. Its large frond consists of recurrent segments that in turn divide into smaller elements. Each small segment resembles the general structural principle of the entire frond. Visually, the fern is often perceived as an almost ideal image of fractal nature: the large form is repeated in the intermediate, the intermediate in the small, and the small in still finer elements. It must nevertheless be remembered that this is not a mathematical copy, but living, variable and organic fractality.

The fern demonstrates that self-similarity may be connected with a developmental programme while being realised through specific conditions. Light, humidity, space, the age of the plant, damage, direction of growth and environment all influence its actual form. Every fern frond is therefore individual, although the general principle is preserved. This is very important to the hypothesis of the Unified Matrix of the Universe: the Matrix should not be understood as a rigid geometrical template. It is manifested instead as a recurrent organisational rule that permits living diversity.

The tree as an integral plant form reveals self-similarity on a still broader scale. The root, trunk, branches, twigs, leaves and veins form a hierarchical system. The trunk establishes the principal axis, large branches unfold through space, smaller branches refine their directions, leaves create a surface of exchange, and leaf veins reproduce the distributive logic of the tree in miniature. The tree seems repeatedly to reproduce its own principle: from centre to periphery, from a strong axis to fine ramifications, and from a concealed root to an unfolded crown.

In this sense, the tree is not only a biological object, but also a powerful morphological model. It demonstrates the relationship among centre, axis, branching, level, cycle and reproduction. The root is concealed, but nourishes the form. The trunk is visible and maintains verticality. The branches distribute the structure through space. The leaves connect the plant with light and air. Flowers and fruits return the system to the seed. The tree therefore becomes a natural image of self-similar morphogenesis: it repeats itself in its parts while preserving wholeness.

The vascular networks of living organisms demonstrate self-similarity in its most rigorously functional form. The circulatory system, lymphatic system, the conducting tissues of plants and the bronchial tree are organised according to the principle of branching. A large vessel or channel divides into smaller ones, and these into still smaller ones, until the system reaches the level of fine capillaries, small conducting elements or alveolar structures. This architecture connects a central source or main channel with an enormous number of peripheral points.

The bronchial tree provides an especially illustrative example. Air enters through the large airways, after which the flow is distributed through progressively smaller branches of the bronchi and bronchioles until it reaches the regions of gas exchange. This form solves a specific problem: the maximum distribution of a flow within a limited volume. If the lungs were organised as a simple cavity, their surface area would be insufficient. A branching, self-similar architecture repeatedly increases the area of contact and makes the function possible. Here self-similarity is directly connected with life.

The circulatory system operates according to a similar principle. Large vessels divide into smaller ones and then into capillaries, where exchange takes place. This structure connects the centre and periphery of the organism. The heart cannot deliver blood directly to every cell; a hierarchical network is necessary. Branching therefore becomes not only a form, but also a condition for the functioning of the whole. Within this system, the part repeats the principle of the whole: every level of the vascular network distributes the flow further, refining the general pattern.

The conducting systems of plants are likewise based on distribution. Water and dissolved substances rise from the roots to the stem, branches and leaves, while the products of photosynthesis are distributed throughout the organism. The veins of a leaf continue this logic at the level of the leaf surface. They form a network in which larger lines lead to smaller ones. Tree and leaf are thus connected through the same morphological grammar: axis, branching, network, periphery and exchange. This is one of the most expressive examples of how the part reproduces the principle of the whole.

Neural structures add the dimensions of connection and information to self-similarity. Neurons possess a cell body, processes, dendrites, axonal branches and synaptic contacts. The nervous system as a whole is an exceptionally complex network in which form is connected with signal transmission. Dendritic branching allows a cell to receive signals from numerous other cells, while axonal branches permit signals to be transmitted to different regions. Here self-similarity is associated not with the distribution of matter, as in the vascular system, but with the distribution of information. The morphological principle of a branching network is nevertheless preserved.

Biological self-similarity is not always tree-like. It may also be manifested in radial forms. A flower is frequently organised around a centre. Petals, sepals, stamens, pistils and other elements form a radial or approximately radial structure. An individual petal may itself possess an axis, venation, an edge and a microstructure. Within the flower, the whole unfolds from the centre, while the individual elements reproduce the logic of directed growth. Here radiality is combined with layering and modularity.

Floral forms are particularly important to the hypothesis of the Unified Matrix of the Universe because they demonstrate self-similarity not only as branching, but also as unfolding. A flower emerges from a bud within which its elements were folded, compressed and concealed. As it opens, they spread outwards from the centre and form a visible structure. The petals may resemble one another, but each retains its individuality. Their rhythm creates the whole. The flower demonstrates that self-similarity may be modular: an integral form is created through the repetition of related but non-identical elements.

Modularity is one of the most important properties of living systems. An organism is frequently constructed from recurrent units: segments, leaves, petals, branches, vascular ramifications and cellular structures. These units recur but are not absolutely identical. They occupy different positions, possess different dimensions and perform different functions according to their context. Modularity allows a living system to unite stability of plan with flexibility of realisation. Living forms are therefore recognisable by type while remaining individual in detail.

Corals demonstrate another form of biological self-similarity. Their structures may be branching, bush-like, plate-like, massive, brain-like or radial. A coral colony develops through the repetition of elements, growth edges, branching and interaction with the environment. Individual organisms form a collective structure that surpasses each element. Here self-similarity is associated not only with an individual organism, but also with colonial organisation. Form arises through the repeated multiplication of living modules.

Coral structures are also important because they occupy an intermediate position between living growth and mineral architecture. Corals are living organisms, but they create solid calcareous structures that may persist, accumulate and form reefs. Within them, biological morphogenesis passes into a geologically significant form. This demonstrates that the boundary between living and non-living systems may be complex in morphological terms: a living process creates a mineral structure, and the mineral structure becomes an environment for further life.

The sel—similarity of living systems is also connected with surfaces. Many living forms tend to increase the surface area available for interaction with the environment. A leaf increases the area of contact with light. The lungs increase the surface area for gas exchange. Intestinal villi increase the surface available for absorption. Roots increase the area of interaction with soil. Corals and sponges create complex surfaces for exchange with water. Fractal and fractal-like forms provide an efficient means of obtaining a large surface within a limited volume or space.

This functional aspect of self-similarity is particularly important. Fractality in living systems is not decorative; it works. Branching, folding, the repetition of modules, increasing surface complexity and a hierarchy of levels enable an organism to perform the tasks of exchange, transport, nutrition, respiration, perception and growth. Biological self-similarity therefore demonstrates that the recurrence of form is connected with survival and function. If the Matrix is discussed in this context, it is manifested not as an aesthetic pattern, but as structural expediency.

Living systems also demonstrate that fractality has limits. An organism cannot repeat its structure infinitely. There are physical constraints of size, energy, material, cell division, metabolism, tissue strength and transport speed. Biological fractals are therefore always finite. A tree possesses a maximum height and branch thickness. A vascular network has a minimum capillary diameter. A leaf has a specific size and edge. A coral is subject to conditions of growth and destruction. This is an important distinction between natural self-similarity and mathematical infinity.

The limits of self-similarity do not diminish its significance. On the contrary, they demonstrate that fractality in nature is always embodied in material. It is governed by environment, function, energy, time and stability. This is why it constitutes not an abstract geometry, but a morphogenetic principle. Within the hypothesis of the Unified Matrix of the Universe, this means that the Matrix cannot be an infinitely repeating ideal form. It is manifested in specific finite forms in which a general principle is constrained by conditions of existence.

The relationship between symmetry and self-similarity provides an important example. A flower may be radially symmetrical, but its petals possess individual differences. A leaf may have a central axis, but its venation is not always perfectly symmetrical. A tree may exhibit a general principle of branching, but its crown is often asymmetrical. A neural network may be functionally organised, but its pattern is unique. Self-similarity in living systems does not eliminate asymmetry; it coexists with it. This confirms an important proposition: natural order is not mechanical regularity.

Self-similarity is also connected with development over time. A branching structure does not arise all at once. First there is a growth point or axis, followed by the first branch, then the second, and finally a network. In vascular systems, roots, trees, neural structures, corals and leaves, self-similarity is the result of successive morphogenesis. It is not simply ‘drawn’ in the finished form. It is created over time through the repetition of developmental solutions. A self-similar form therefore always bears the memory of development.

This memory is especially visible in a tree. The crown of a tree is the history of its growth. Every branch indicates a past direction of development and records conditions of light, space, wind, damage and competition with other plants. Self-similarity here is not abstract: it is inscribed in the biography of the form. The tree may therefore be regarded as a living archive of morphogenesis. A part repeats the general principle, but every part bears the trace of specific conditions.

The same may be said of vascular and neural networks. Their forms depend on the developmental history of tissues, the needs of the organism, growth signals, local conditions, mechanical obstacles and functional demands. A network does not arise as a perfectly uniform scheme. It develops, reorganises and becomes refined. The result is a structure in which a general principle of distribution is combined with the individual history of the organism. This demonstrates once again that self-similarity in living systems is not a static geometry, but a process.

For the hypothesis of the Unified Matrix of the Universe, living self-similarity possesses the status of the first compelling level. Here it is possible to observe how form repeats itself within itself. The seed bears the possibility of the plant; the tree repeats the principle of branching in its branches; the leaf repeats the distributive logic of the tree in its veins; the flower repeats centred radiality in its petals; and vascular and neural networks repeat the principle of ramification. The living system proves to be multilevel, with every level connected to others through recurrent organisational motifs.

It is nevertheless necessary to avoid concluding directly that the self-similarity of living systems proves the existence of the Unified Matrix of the Universe. It establishes a more limited but important proposition: living forms are indeed frequently organised through recurrent morphogenetic principles. This provides a basis for the next question: do similar principles occur in non-living nature and the cosmos? If they do, the analysis can be expanded. If they do not, the hypothesis must remain within the limits of biology. Biological self-similarity is therefore a point of departure, not conclusive proof.

Living self-similar structures should be compared with geological and cosmic forms only after their features have been defined clearly. If a vascular network and river system are compared, the discussion must concern not the identity of life and landscape, but the structural function of flow distribution. If floral radiality and a cosmic shell are compared, biological unfolding and astrophysical expansion must be distinguished, although the centre, periphery, layers and radial directions may be analysed. If a tree is compared with the cultural image of the World Tree, the living organism and symbol must be distinguished, although the axis, root, branches, levels and fruit may be identified.

In this sense, living systems provide a methodological model for the study. They demonstrate the features that should be sought: centre, axis, branching, layer, edge, network, modularity, radiality, spirality, recurrence of the part within the whole, the relationship between form and function, and staged development. These features may subsequently be used to analyse geology, the cosmos and culture. Biological material thus becomes the first evident level at which the Matrix is manifested—not because it directly explains everything else, but because the logic of morphogenesis is most clearly visible within it.

Floral form is of particular significance. It combines several key principles: the bud as a closed potential structure; opening as a transition to manifestation; the centre as an organising core; petals as recurrent modules; radiality as propagation from the centre; layering as a memory of stages; the edge as an active zone of form; and the fruit as a transition to a new seed. The flower

is therefore not merely a beautiful object, but a complex morphogenetic model. This is why it will play an important role in the subsequent analysis of the Matrix.

Leaf form complements floral form. Whereas the flower demonstrates unfolding, the leaf demonstrates distribution. Its central vein, lateral branches, network of small veins and edge form a system within which a surface becomes organised. The leaf effectively translates an axis into a network. It demonstrates that form may be not only radial, but also branching; not only open, but also distributive. Within the hypothesis of the Unified Matrix of the Universe, leaf-like unfolding is connected precisely with this logic: form proceeds from a centre or axis and creates a surface, layers, edges and a network.

The fern, tree, vascular network, bronchi, corals and neural structures extend this biological sequence. They all demonstrate that self-similarity is not a rare exception, but one of the widespread modes of organising living systems. In each case, part and whole are connected through the recurrence of a principle. In each case, form is a process rather than a static contour. In each case, recurrence is combined with variability. It is precisely this that makes living systems indispensable material for constructing a universal morphological theory.

Self-similarity in living systems may therefore be defined as the recurrence of a structural principle of organisation at different levels of an organism or living form. It is manifested in leaves, ferns, trees, vascular networks, the bronchial tree, corals, neural structures and floral forms. This recurrence is not decorative. It is associated with growth, distribution, exchange, function, stability and reproduction. Living fractality demonstrates that an organism is constructed not as a random sum of parts, but as a multilevel system in which the part bears the principle of the whole.

For the hypothesis of the Unified Matrix of the Universe, this means that the biological level provides the first fundamental material for understanding the Matrix as a language of self-similar form generation. It clearly demonstrates that form can unfold from internal potential, repeat its own principle within its parts, preserve wholeness through branching and return to a new beginning through the cycle of the seed. The subsequent task is to determine how self-similarity is manifested beyond the living realm—above all, in geology, where forms arise not through biological growth, but through pressure, flow, faulting, erosion, layering and vast periods of time.

4.3. Self-Similarity in Geology

Geology provides distinctive material for understanding self-similarity because form arises here not through biological growth, but through pressure, faulting, folding, crystallisation, erosion, the movement of water, volcanic activity, sedimentation and the prolonged action of time. Whereas self-similarity in living systems is associated with the development of an organism, the distribution of matter and the functions of life, in geological systems it is associated with the behaviour of dense matter, stresses within the Earth’s crust, the interaction of surfaces with flows and the gradual recording of processes in landforms, stone and landscape.

It is geology that makes it possible to expand the understanding of fractality beyond biology. A stone, geological fold, river network, coastline, fault, volcanic flow or underwater landform is not a living organism. Such forms possess no genetic programme, metabolism, embryogenesis or biological reproduction. They may nevertheless display the recurrence of structural principles at

different scales: branching, layering, folding, irregularity of the edge, radiality, fracturing, wave-like organisation and self-similarity of contours. Fractality is therefore not only a property of living growth, but a broader mode of organising natural matter.

River networks provide one of the most evident examples of geological self-similarity. A river rarely exists as a single line. It collects water from numerous small streams that flow into larger ones, which in turn join still larger channels until the entire system forms a drainage basin. This structure is hierarchical. A small tributary repeats the general principle of a large river: it collects water, moves down a gradient, possesses its own lateral tributaries, forms a channel and becomes integrated into a larger system. A river network thereby becomes a geological analogue of a branching structure.

A river network may be compared with a tree or vascular system, but such comparison requires caution. A river is not a plant and its tributaries are not biological branches. The mechanism is different: water moves under the influence of gravity, relief, rock composition, climate, precipitation and erosion. The morphological principle is nevertheless comparable: movement from numerous small channels to a large channel, from the periphery to the centre of drainage, and from a local flow to an integrated system. It is at this level that a river network may be regarded as an example of self-similar organisation in non-living nature.

A river system also demonstrates that self-similarity is connected with process rather than merely with pattern. The branching network was not created instantaneously. It forms over time: water finds a path, deepens the channel, encounters obstacles, changes direction, erodes some areas and leaves others. Small flows gradually become stable channels, channels connect and the basin acquires structure. Geological self-similarity is therefore a record of the prolonged action of water and relief. Here form preserves the history of movement.

Coastlines provide another classic example of natural fractality. On a map, a coast may appear to be a simple line separating land from water. As the scale is enlarged, however, this line reveals ever more bends, bays, gulfs, capes, projections, ruptures, small irregularities and complex contours. The more detailed the observation, the more complex the boundary becomes. This demonstrates that a coastline is not a smooth geometrical curve. It possesses an irregularity that may persist at different scales.

The fractality of a coastline is important not only as a mathematical example. It also possesses morphogenetic meaning. The coast is an active boundary between land and water. Waves, currents, tides, rocks, wind, precipitation, climate, biological processes and time meet there. The edge of the land is therefore not a passive line. It is constantly being formed, destroyed, refined and reorganised. Within the hypothesis of the Unified Matrix of the Universe, the coastline may be regarded as a geological example of an active edge: a zone in which the internal structure of matter interacts with its environment and acquires a complex self-similar form.

Geological folds likewise display self-similar organisation. At a large scale, a mountain system may possess principal ridges, valleys, lines of uplift and directions of folding. When examined in greater detail, smaller folds, faults, cracks, scarps, scree slopes, crests and lines of stress can be found within these larger structures. Smaller forms do not reproduce larger ones with mathematical precision, but they frequently retain the general character of the deformation. Mountainous relief is thus a multiscale structure in which the large and the small are connected through recurrent processes of pressure, destruction and redistribution of matter.

Folding is particularly important to the hypothesis of the Matrix because it demonstrates form generation through compression and stress. In biology, the unfolding of a leaf or flower is frequently associated with growth and opening. In geology, form may instead arise through pressure, bending, compression and deformation. The result may nevertheless be morphologically complex: layers, waves, fold axes, edges, ruptures and recurrent lines emerge. This expands the understanding of morphogenesis: form may arise not only through unfolding, but also through the stressed folding of matter.

Faults and cracks provide another important example of geological self-similarity. A crack rarely remains a single straight line. It may branch, form a network, generate secondary cracks and connect with other lines of stress. In drying clay, cliffs, ice surfaces, volcanic rocks and stone textures, it is possible to observe fault systems in which large lines are accompanied by smaller ones, and these by still finer ones. Such a structure demonstrates how stress is distributed within a material and how the internal state of matter becomes visible at the surface.

Fracturing possesses particular philosophical and morphological significance. At first sight, a crack appears to constitute the destruction of form. In geological terms, however, it simultaneously destroys a previous homogeneity and creates a new structure. It opens the internal, establishes direction, forms a boundary and translates concealed stress into a visible line. A crack is therefore not only a trace of disintegration, but also a morphogenetic event. It manifests the transition of matter from a concealed state to an expressed structure.

Stone textures make it possible to observe self-similarity in a denser and more localised form. A stone may display layers, waves, rings, veins, inclusions, crystalline lines, faults, growth patterns and traces of pressure. These structures sometimes resemble organic forms: tree rings, tissue layers, petal-like unfolding, waves, branches or networks. It is important, however, not to conclude hastily that a stone is a living organism. Stone records geological and mineralogical processes. Its resemblance to biological forms should be analysed not as an identity, but as a possible manifestation of comparable principles of organisation: layering, rhythm, centre, edge, internal stress and self-similarity.

In this respect, stone may be regarded as a ‘slow form’. It does not develop in biological time. Its morphology takes shape within a different temporality: through pressure, deposition, crystallisation, cooling, dissolution, crack formation, the transfer of matter and prolonged stabilisation. Time appears to become condensed within stone. Its structure becomes an archive of processes that occurred within the material. The self-similarity of stone textures demonstrates that even dense non-living matter can preserve recurrent traces of internal organisation.

Volcanic structures also possess fractal and self-similar features. Lava flows, cracks on volcanic slopes, radial faults, cones, calderas, outflow channels, solidified surfaces and ash deposits may form complex multiscale structures. Here form generation is associated with the movement of molten matter, temperature, gas pressure, relief, cooling and destruction. Volcanic form is born from a combination of the Earth’s internal energy and the external conditions of its surface. It therefore demonstrates particularly clearly the connection between geology and non-equilibrium processes.

A volcanic flow may behave as a dynamic system that creates channels, tongues, branching directions, solidification edges and layered surfaces. Solidified lava records former movement. What was once a flow becomes stone. What was once a dynamic process becomes a stable form. This manifests a fundamental principle of geological morphogenesis: form is frequently arrested movement, preserved dynamics and materialised history.

Mountainous and volcanic structures also display radiality. Flows, cracks, slopes, ravines, channels and lines of destruction may radiate from a volcanic centre. Craters possess a centred form. Impact structures and certain geological domes may likewise possess radial organisation. This is important to the hypothesis of the Unified Matrix of the Universe because radiality is one of its recurrent invariants: the centre becomes the source of diverging directions. In geology, such radiality is connected not with flowering, but with pressure, ejection, impact, eruption or gravitational distribution. The morphological scheme of 'centre–periphery' is nevertheless preserved.

Self-similarity in geology is also manifested in relief as a whole. If the Earth's surface is viewed from different elevations, large valleys can be seen to contain smaller valleys, large mountain ranges to be accompanied by smaller ridges, principal lines of destruction to branch into secondary lines, and small forms frequently to repeat the general character of larger ones. Satellite images reveal this multiscale organisation especially clearly. The Earth's surface is not a smooth shell; it is a complex system of folds, flows, faults, edges and levels.

This multiscale organisation is directly related to fractal geometry. Relief may be described through parameters of roughness, self-similarity, recurrence of contours and fractal dimension. Real relief is not, of course, an ideal fractal. It is constrained by geological history, rock composition, climate, water, ice, tectonics, vegetation and human influence. Fractal-like organisation is nevertheless frequently present: larger forms divide into smaller ones, while smaller forms retain the general character of the process.

A fundamental feature of geological self-similarity is that it forms through an interaction between creation and destruction. In biology, self-similarity is more frequently associated with growth and development. In geology, form often arises through destruction: erosion, cracking, scouring, collapse, weathering, displacement and faulting. Destruction here does not always mean the disappearance of form. It may be a means of refining it. Water erodes rock and creates a channel. Wind destroys a surface and forms dunes. Ice fractures stone and creates new contours. A fault destroys continuity but creates structure. Geological morphogenesis therefore demonstrates that form may be born through the disintegration of a previous homogeneity.

This is particularly important to the philosophical understanding of the Matrix. If the hypothesis is restricted to images of growth, unfolding and flowering, it may appear excessively biologised. Geology demonstrates that a universal theory of form must also encompass pressure, resistance, deformation, destruction, cracking, folding, weathering and stabilisation. If the Matrix aspires to describe a broad morphogenetic order, it must account not only for the gentle unfolding of form, but also for the forceful form generation of dense matter.

Layering is one of the principal geological invariants. Sedimentary rocks, metamorphic structures, lava flows, glacial deposits, crystalline textures and geological sections frequently possess clearly expressed layers. Each layer may record a particular stage of accumulation, pressure, chemical change, temperature or environment. Layering makes time visible. Unlike a biological leaf or bud, where layers are associated with tissue growth, geological layers are associated with the history of matter. In both cases, however, the layer is a form of memory.

Layering may also be self-similar. Large strata may contain internal beds, these may contain fine lines, inclusions, rhythmic structures and microcracks. One level repeats the principle of another: division, boundary, accumulation, transition and a new surface. Within the hypothesis of the Matrix, this permits the layer to be regarded as a universal feature of staged development.

Form does not arise all at once; it takes shape through a succession of states. In geology, this succession is frequently inscribed literally in stone.

Underwater relief is of particular significance. It is concealed from direct vision, but modern maps of the ocean floor reveal complex forms: ridges, depressions, faults, volcanic uplifts, canyons, fan deposits, radial structures, waves and folded regions. Underwater relief reminds us that a significant part of geological morphology remains invisible without specialised means of observation. This is important to the hypothesis: visible form does not exhaust the reality of form. The Matrix may also be manifested in concealed structures that become accessible only through scientific imagery, maps, models or reconstructions.

Underwater forms frequently display a combination of branching, layering and radiality. Submarine canyons may possess structures resembling river systems. Mid-ocean ridges and faults establish axial lines. Volcanic islands and submarine volcanoes may create radial slopes and flows. These structures demonstrate that geological morphogenesis is not confined to land. It operates within the Earth's crust, underwater and in the planet's concealed layers. This expands the field of BIO–GEO–COS analysis by adding deep geological morphology to visible relief.

Geological self-similarity is also connected with the scale relativity of perception. A small stone may contain patterns resembling large landscapes. A fragment of rock may possess lines similar to geological folds or river networks. The surface of a mineral may resemble a topographical map. Caution is again necessary, however: visual resemblance alone is not evidence of a single process. It becomes scientifically significant only when recurrent structural features can be identified: layering, branching, a centre, edge, fracturing, directionality and recurrence across scales.

This is why the transition from image to parameter is particularly important in geological analysis. The following questions must be asked: What kind of structure is before us? Does it possess a hierarchy of levels? Does its contour recur as the scale changes? Is branching present? How are the cracks distributed? Is there an axis of folding? How are the layers expressed? What is the character of the edge? Can the fractal dimension be measured? Can the structure be compared with other geological objects? Only such an approach makes self-similarity a research category rather than an aesthetic association.

Within the hypothesis of the Unified Matrix of the Universe, geology performs the role of a critically important test. If morphogenetic invariants are found only in living nature, the Matrix remains a biological model. If similar principles—the centre, axis, layering, branching, radiality, active edge and fractality—are also found in dense non-living matter, the hypothesis acquires a broader foundation. Geology demonstrates that form can arise where there is no life, but where matter, energy, stress, movement, environment and time are present.

The geological level must not, however, replace physics and geology with philosophical interpretation. Every form has a specific origin. A river network is explained through hydrology and relief. A geological fold is explained through tectonics and rock deformation. A fault is explained through stresses within the Earth's crust. A coastline is explained through interactions among land, water and climate. A volcanic structure is explained through magmatic processes. Stone texture is explained through mineralogy and the history of matter. The hypothesis of the Matrix does not negate these explanations. It poses an additional morphological question above them: which structural principles recur in these different processes?

This approach avoids two errors. The first is to mystify geological forms by declaring them direct signs of a universal code without analysis. The second is to reject comparison merely because geology differs from biology. A scientifically productive position lies between these extremes. Geological forms are neither symbols in the direct sense nor living organisms. They are forms of matter that have arisen through processes of self-organisation, stress and time. They may therefore be included in comparative morphology.

Self-similarity in geology demonstrates that non-living nature can create structures in which part and whole are connected through the recurrence of a principle. A river tributary repeats the logic of the drainage basin. A small fold repeats the character of a larger deformation. A secondary crack continues the principle of the principal fault. A small bend in a coastline reproduces the general irregularity of the line. A layer within a layer records the rhythm of geological time. Stone texture may repeat a motif of a wave, line, ring or branching at different levels. All this provides grounds for regarding geology as an independent level of fractal morphogenesis.

It is especially important to the hypothesis of the Matrix that geological self-similarity connects density and movement. Stone appears motionless, yet its structure may be a trace of the movement of matter. Relief appears stable, yet it results from continuous change. A mountain appears eternal, yet it arose, became deformed and was eroded. A coastline appears to be a line, yet it is constantly being reorganised. Geology demonstrates that form may be a process made static. It is precisely this idea that connects geological material with the general concept of morphogenesis: form is not only a thing, but also a trace of becoming.

Self-similarity in geology is thus manifested in river networks, geological folds, faults, coastlines, volcanic structures, underwater relief and stone textures. It is associated with the branching of flows, the distribution of stresses, active edges, layering, fracturing, radiality and the multiscale organisation of relief. This self-similarity is not biological and must not be described as the life of a stone or mountain. It does, however, demonstrate that non-living matter is likewise capable of complex form generation in which a part may reproduce the general principle of the whole.

In the context of the hypothesis of the Unified Matrix of the Universe, the geological level confirms the need for an expanded language of form. Biology provides a model of living growth; geology provides a model of slow, dense and highly stressed form generation operating over deep time. Together, they demonstrate that fractality and self-similarity may be understood as universal morphological principles manifested in different regimes of matter. The next step is to consider self-similarity in the cosmos, where the same questions concerning the centre, spiral, radiality, layering and multiscale organisation are transferred to the largest dimensions of the Universe.

4.4. Self-Similarity in the Cosmos

The cosmic level is simultaneously the largest-scale and the most methodologically complex domain in which to discuss self-similarity. Whereas biological form is associated with life, growth, tissues and function, and geological form with dense matter, pressure, faults, flows and time, form generation in the cosmos unfolds within a different physical environment. Gravity, gas dynamics, radiation, magnetic fields, rotation, shock waves, turbulence, expansion, collapse, star formation and interactions of matter operate over enormous spatial and temporal scales. Cosmic self-similarity cannot therefore be understood as a simple continuation of biological or geological form. It requires a distinct language and particular caution.

Nevertheless, it is the cosmos that provides one of the most powerful visual impulses for the hypothesis of the Unified Matrix of the Universe. Images of nebulae, galaxies, stellar clouds, gas-and-dust shells and spiral structures frequently reveal motifs already familiar from living and geological nature: centre, periphery, radiality, spirality, filamentary structure, layering, an active edge, ruptures, branching cloud structures, recurrent contours and the multiscale organisation of matter. These similarities must not be interpreted as direct evidence of a single mechanism. They nevertheless require serious morphological analysis.

It must first be emphasised that cosmic objects are not living organisms. A nebula does not ‘grow’ like a plant, a galaxy does not ‘unfold’ like a flower, and a stellar cloud does not ‘branch’ like a tree in the biological sense. Such expressions may be used only metaphorically or morphologically, provided their status is clarified immediately. Scientific analysis must concern not the biologisation of the cosmos, but the comparison of structural principles: how matter is distributed, where a centre arises, how the periphery forms, how a spiral emerges, what creates a shell, and how edges, layers and heterogeneities are expressed.

Cosmic form, like every other natural form, does not arise from nothing. It results from processes. A gas-and-dust cloud may contract, expand, rupture, rotate, interact with radiation and form regions of greater and lesser density. Stellar birth and death produce shells, waves, ejecta and complex structures within the interstellar medium. Galaxies form through the gravitational interaction of matter, rotation, mergers, and the distribution of gas, stars and dark matter. In every case, form is a trace of dynamics. It demonstrates not only what an object looks like, but also the processes that formed it.

Nebulae are among the most expressive examples of cosmic form generation. They may possess cloud-like, filamentary, shell-like, radial, ring-shaped, bilobed, asymmetrical or complex multilayered structures. Some nebulae appear as open shells, others as clusters of filaments, others as bright centres with radiating regions, and still others as ruptured cloud fields. Visually, they frequently resemble organic or geological forms, but their physical nature is different. They arise through interactions among gas, dust, radiation, stellar winds, shock waves and gravity.

Nebulae are important to the hypothesis of the Unified Matrix of the Universe because they demonstrate morphogenesis within a rarefied cosmic medium. Here form possesses neither a solid surface, as stone does, nor tissue, as a plant does. It exists as a distribution of matter and energy. Nevertheless, it may possess a centre, direction, layers, edges, filaments and regions of concentration. This expands the understanding of form: form need not be a dense body. It may be a field of distribution, a cloud, shell, contour of intensity or a dynamic configuration of matter.

The shell-like organisation of cosmic forms is especially important. Many nebulae and remnants of stellar processes possess structures in which matter is distributed around a central region or along diverging fronts. These shells may be complete, partial, ruptured, multilayered or asymmetrical. Morphologically, they resemble the principle of ‘centre–unfolding–edge’, although physically they are associated with the expansion of gas, the ejection of matter, radiation pressure or shock waves. Within the hypothesis of the Matrix, such a structure may be considered a cosmic variant of the transition from internal concentration to manifested periphery.

The active edge of a nebula is also of considerable interest. In biology, the edge of a leaf or petal is a zone of growth and interaction with the environment. In geology, a coastline, crack or fold is a zone of contact between forces and materials. In the cosmos, the edge of a nebula or gas cloud may be a region in which radiation, density, temperature, shock waves, magnetic fields and the surrounding interstellar medium interact. It frequently possesses an irregular, scalloped,

filamentary or ruptured structure. It is at the edge that cosmic form is revealed not as a smooth ideal figure, but as something born within the highly stressed dynamics of its environment.

Spiral galaxies provide another kind of cosmic self-similarity. Their form is organised around a centre and diverging arms. Here the spiral is not a decorative pattern, but an expression of the gravitational and dynamic organisation of matter. A galactic spiral unites a centre, rotation, periphery, arms, density waves, stellar regions and the distribution of gas. Morphologically, the spiral galaxy is especially important because it demonstrates one of nature's most universal images: development through rotation, repetition and increasing distance from a centre.

The spiral as a form has profound significance for the hypothesis of the Matrix. In biology, it occurs in the arrangement of leaves, seeds, shells, inflorescences and certain growth structures. In geology and hydrodynamics, it is manifested in vortices, flows, cyclones and structures of deformation. In the cosmos, it occurs in galactic arms and certain gas-and-dust formations. In each case, the physical cause differs. The morphological principle nevertheless remains comparable: the structure retains a connection with the centre but does not remain a closed circle; it repeats a movement, but every new turn occupies a different position. The spiral unites cyclicality and development.

Cosmic spirality is particularly illustrative because it is manifested at scales incomparable with biological ones. If a similar morphological principle is identified in such different domains, the question concerns not a direct relationship among the objects, but the recurrence of geometrical and dynamic solutions. Rotation, the distribution of matter, density gradients and the relationship between centre and periphery may create spiral forms in different systems. The spiral may therefore be regarded as a powerful morphogenetic invariant requiring interdisciplinary analysis.

Stellar clouds and large regions of the interstellar medium may likewise possess self-similar structures. Clumps, filaments, voids, dense areas, rarefied regions and complex contours may be manifested within them at different scales. Such structure may result from turbulence, gravitational instability, magnetic fields, shock waves and stellar activity. Visually, it may sometimes resemble clouds in the Earth's atmosphere, smoke, tissue, fibres or geological textures. The scientific task, however, is not to yield to the impression of resemblance, but to determine whether multiscale recurrence of organisation is actually present.

Cosmic self-similarity may be manifested as a hierarchy of structures. Small condensations of matter form parts of larger clouds, these form parts of stellar complexes, the complexes form parts of galactic regions, and galaxies form groups and clusters. At different levels, the distribution of matter may display heterogeneity, clustering, filamentary organisation and voids. This does not mean that the Universe is an ideal fractal at every scale. Such a conclusion would be too strong and would require rigorous cosmological substantiation. The very idea of the multiscale organisation of cosmic matter is nevertheless significant to the hypothesis because it permits self-similarity to be regarded as a possible principle of large-scale structure.

Scientific caution is especially important here. The cosmos is a domain in which visual images may be highly compelling while simultaneously being liable to mislead. Colours in astrophotography frequently result from data processing, different ranges of radiation, filters and compositing. What visually resembles a flower, eye, tree or shell may physically be an entirely different process. Cosmic images cannot therefore be used as direct evidence for the hypothesis. They must be treated as material for morphological analysis rather than conclusive confirmation.

At the cosmic level, it is particularly important to distinguish three things: physical mechanism, visual form and morphological invariant. The physical mechanism explains why an object arose in a particular way—through gravity, explosion, radiation, rotation, magnetic fields or interactions between gases. Visual form is what appears in an image: a shell, spiral, filaments, centre or edges. A morphological invariant is a structural principle that may be compared with other systems: centred organisation, radiality, layering, spirality, self-similarity or an active periphery. The hypothesis of the Matrix operates specifically at the level of invariants without negating the physical mechanism.

Self-similarity in the cosmos is also connected with the problem of scale. At the terrestrial level, human beings perceive trees, leaves, stones, rivers and mountains directly. Cosmic structures are accessible only through instruments, telescopes, models, computational processing and scientific reconstructions. Cosmic form is therefore always mediated to a certain extent. We do not see the object itself with the unaided eye in the ordinary sense, but an image constructed from data. Work with cosmic structures consequently requires even greater methodological precision.

Mediation does not, however, negate the reality of form. A scientific image of a nebula or galaxy is a means of visualising a real distribution of matter, energy or radiation. It makes visible a structure inaccessible to ordinary sight. Modern astrophotography and astronomical maps thus expand the field of morphology. They demonstrate that form exists not only at familiar human scales, but also in the depths of the cosmos. This makes the cosmic level essential to a hypothesis that seeks to describe form generation throughout the Universe.

The radiality of cosmic forms is of particular interest. A radial structure may arise around a star, the centre of an explosion, the core of a nebula, a gravitational region or an energy source. Visually, it may be manifested as rays, shells, diverging filaments, rings or expanding zones. Radiality demonstrates the relationship between centre and periphery, one of the principal morphogenetic invariants of the hypothesis. Clarification is again required, however: the radiality of a flower is associated with biological growth, whereas the radiality of a nebula is associated with an astrophysical process. What is comparable is not the mechanism, but the structure of direction extending from the centre.

Layering in cosmic forms may likewise be significant. Certain nebulae and shell-like structures display multiple levels of matter, external and internal shells, expanding fronts, rings and zones of different density or brightness. These layers may record different stages of a process: ejecta, waves, interaction with the surrounding environment, changes in radiation intensity or the distribution of matter. Morphologically, such layering is close to the idea of the memory of a process. Form preserves traces of successive states.

The filamentary organisation of cosmic structures may be regarded as a particular form of self-similarity. Filaments, threads, extended cloud formations and gaseous structures may recur at different scales and create a complex network. Such forms sometimes resemble roots, blood vessels, neural fibres or river systems. In the cosmos, however, they arise through their own physical conditions: turbulence, magnetic fields, gravity, shock fronts and gas movement. It is therefore appropriate to speak not of biological branching, but of the filamentary or network-like organisation of matter.

Cosmic filamentary organisation is particularly important for comparison with geological and biological networks. In biology, a network frequently distributes liquids, substances or signals. In geology, a network may distribute water, stress or cracks. In the cosmos, a network may express

the distribution of gas, density, magnetic structures or gravitational interactions. The mechanisms differ, but in every case a morphological question arises: why is matter organised not uniformly, but through lines, threads, nodes and intervals? This question lies at the heart of a universal morphology of form.

Galactic structures extend the concept of self-similarity to the level of cosmic architecture. Spiral arms, bars, rings, nuclei, satellite systems, clusters and interacting galaxies demonstrate that the cosmos is not a homogeneous distribution of matter. It is structured. Within this structuring, different morphological types may be distinguished: disc-shaped, elliptical, spiral, irregular, ring-shaped and interacting. Forms in which the centre, rotation, arms, layers or radial propagation are clearly expressed are especially important to the hypothesis of the Matrix.

Galactic forms must not, however, be reduced to symbolic images. A galaxy is a complex astrophysical system, and its form is determined by mass, angular momentum, the distribution of matter, its history of interactions, dark matter, gas, star formation and other factors. Any comparison of a galaxy with a flower, vortex, shell or ancient symbol must therefore remain morphological rather than causal or identificatory. This boundary must be maintained throughout the book.

Cosmic self-similarity also raises the question of the observer. Human beings perceive forms in the cosmos that sometimes resemble terrestrial objects. This may be associated both with objective structural similarities and with characteristics of human perception. We are inclined to recognise familiar images within complex contours. The hypothesis must therefore distinguish morphological analysis from psychological projection. It is not enough for a nebula to resemble a flower. It is necessary to determine which features genuinely correspond: whether a centre, radiality, layers, an edge, recurrent contours, spirality, an axis or a structure of unfolding are present. Only then does resemblance become an object of research.

This point is particularly important to the serious scientific status of the study. Cosmic images possess great aesthetic power. They readily evoke a sense of the profound unity of nature. Scientific argument, however, cannot be built upon aesthetic impression. It must transform impression into an analysis of features. Cosmic material should therefore be used cautiously: as a stimulus for the hypothesis, an object of morphological description and a possible level of comparison, but not as self-sufficient evidence.

Nevertheless, the cosmos does demonstrate that form is a universal problem of matter. Even at the greatest scales of the Universe, matter is not distributed in a completely unstructured way. It forms centres, clouds, discs, spirals, shells, filaments, clusters, voids, fronts, ruptures and layers. Form generation is therefore not an exclusively terrestrial or biological phenomenon. The cosmos confirms that matter is capable of organising itself into structures at every scale, although the modes of this organisation differ.

This is of fundamental significance to the hypothesis of the Unified Matrix of the Universe. If biology demonstrates living morphogenesis and geology demonstrates dense morphogenesis operating over deep time, the cosmos demonstrates the morphogenesis of rarefied and gravitationally organised matter. The same general problem recurs in every case: how does form arise from distributed matter, energy and conditions? How does a centre appear? Why does a structure become spiral, radial, filamentary or layered? Why is the edge frequently complex? Why does multiscale heterogeneity create order rather than eliminate it?

The cosmic level also allows the concept of the ‘Universe’ within the name of the hypothesis to be reconsidered. If the Matrix claims universality, it cannot be restricted to terrestrial forms. Cosmic material must not, however, be attached to the hypothesis merely for the sake of scale. It must be incorporated methodologically through the analysis of structural invariants and a clear distinction between physical and morphological levels. Only then does discussion of the Universe become scientific and philosophical rather than poetic.

Self-similarity in the cosmos may be understood as the possible recurrence of principles governing the organisation of matter at different scales: from gas-and-dust clouds to galactic structures, from local filaments to large systems of distribution, and from central regions to peripheral shells and arms. The degree to which cosmic structure is fractal must remain an open question requiring specialised verification. The hypothesis of the Matrix must not declare in advance that the cosmos is fractal in every respect. It must investigate where and in what sense fractal-like features are genuinely manifested.

Quantitative methods are especially promising in this respect: the analysis of distributions of brightness and density, contours, filamentary structure, clustering, fractal dimension, spectral characteristics of images, boundary structure and scaling regularities. If cosmic forms are included in the hypothesis, they must be accessible not only to visual comparison, but also to measurement. This will make it possible to distinguish genuine structural features from an impression of resemblance.

Self-similarity in the cosmos is therefore an important but exceptionally demanding level of analysis. It opens the possibility of comparing biological, geological and astrophysical forms within a common morphological language. It is here, however, that the risk of excessive analogy is greatest. Cosmic structures must therefore be considered with the utmost caution: as forms created through specific physical processes but amenable to analysis according to shared features—the centre, axis, radiality, spirality, layering, filamentary structure, active edge and recurrence across scales.

For the hypothesis of the Unified Matrix of the Universe, the cosmos is not an embellishment, but the ultimate test of scale. If morphogenetic invariants are genuinely manifested here as well, the hypothesis gains a basis for speaking of form as a universal language of matter. This basis must, however, be constructed not upon impression, but upon disciplined comparative analysis. Cosmic material will therefore be especially important in subsequent chapters devoted to nebulae, galactic structures and comparative BIO–GEO–COS series.

Self-similarity in the cosmos may consequently be regarded as a possible manifestation of the multiscale organisation of matter, in which part and whole are connected through recurrent structural motifs: cloud-like structure, filamentary organisation, spirality, radiality, shell-like organisation, centred organisation and a complex edge. These motifs do not automatically prove the existence of the Unified Matrix, but they expand the field of inquiry. They demonstrate that the problem of form does not end at the level of the organism or planet. It continues within cosmic matter, where the same fundamental questions of order, chaos, centre, symmetry, symmetry breaking and self-similarity acquire their greatest scale.

4.5. Fractality as an Invariant of the Hypothesis

Fractality occupies a special place within the hypothesis of the Unified Matrix of the Universe. It makes it possible to move from the simple observation of resemblance between forms to a more rigorous understanding of the recurrence of organisational principles. Within the hypothesis, fractality should not be understood as decorative similarity, a visual effect or an arbitrary comparison between objects. Its significance is far deeper: fractality functions as one of the key morphogenetic invariants demonstrating that a particular principle of form may be reproduced at different scales, in different environments and through different material bearers.

Fractality must therefore be distinguished from external analogy. When a leaf resembles a tree, a river network resembles a vascular system, a nebula resembles a flower, or stone texture resembles a landscape, this does not yet constitute evidence of a universal law. Visual resemblance may be coincidental or subjective, or may result from the tendency of human perception to identify familiar images in complex structures. If, however, a more rigorous analysis reveals the recurrence of the same structural principles in different objects—the centre, axis, branching, layering, active edge, radiality, spirality, hierarchy of levels and self-similarity—the issue is no longer decorative resemblance, but a possible morphological invariant.

Within the hypothesis of the Matrix, fractality is understood primarily as the recurrence of an organisational principle at different scales. This means that the part need not reproduce the whole literally, but may reproduce its structural logic. A tree branch is not a miniature tree in every detail, but it repeats the principle of axial growth and lateral branching. A leaf vein is not a tree trunk, but it reproduces the logic of distribution from a principal line towards peripheral ramifications. A tributary is not a large river, but it operates as part of the same drainage system. A small crack in a stone is not equivalent to a major fault, but it may repeat the principle by which stress propagates. It is this recurrence of principle, rather than literal replication, that is important to the hypothesis.

In this sense, fractality provides the hypothesis of the Matrix with a language of scalability. If a form is manifested only at one level, it is difficult to regard it as a universal principle. If the same mode of organisation is found in part and whole, in the small and the large, in living and non-living nature, and in dense matter and rarefied media, there are grounds for speaking of a deeper morphological regularity. Scalability does not automatically prove the unity of all processes, but it demonstrates that form may possess a stable logic capable of passing between levels.

It is especially important that fractality connects morphogenesis with the concept of the whole. In an ordinary mechanical understanding, a part is a fragment separated from the whole and performing a local function. In a fractal structure, the part preserves a connection with the whole through the recurrence of a principle. It does not merely belong to the whole, but bears its organisational trace. Fractality may therefore be regarded as one of the ways in which the whole is present within the part. This proposition does not require a mystical interpretation. It means that the same process or structural rule may operate at different levels of a system.

This is of fundamental importance to the hypothesis of the Unified Matrix of the Universe. The Matrix is conceived not as an external scheme imposed upon the world, but as a possible internal logic of form generation. If such a logic exists, it must be manifested not only in large integral objects, but also in their elements, fragments, transitions, boundaries and recurrent modules. Fractality demonstrates how such manifestation is possible: a general principle need not be

located exclusively at the centre of the whole; it may be reproduced in a branch, edge, layer, line, pattern, crack, tributary, petal, vein or turn of a spiral.

Fractality must not, however, be regarded as the sole invariant of the Matrix. It is among the most important, but does not exhaust the entire hypothesis. The Matrix as a morphogenetic model also encompasses the centre, axis, symmetry, symmetry breaking, radiality, spirality, layering, staged unfolding, the active periphery and the transition from a potential state to a manifested form. Fractality connects these features across scales. It demonstrates that centred organisation, branching or layering may recur not once, but repeatedly, thereby producing a hierarchy of form.

Fractality is manifested especially clearly in living systems. The leaf, fern, tree, root system, vascular network, bronchial tree, neural structures, corals and floral forms demonstrate the recurrence of an organisational principle within their parts. Here fractality is associated with function: the distribution of liquids, gas exchange, signal transmission, increasing surface area, growth, nutrition, perception and reproduction. Living fractality is not decorative; it works. It enables the organism to connect centre and periphery, large and small, whole and local.

In geology, fractality is manifested differently. River networks, geological folds, faults, coastlines, volcanic structures, underwater relief and stone textures display recurrent forms arising through pressure, flow, destruction, erosion, cracking, crystallisation and prolonged time. There is no biological function here, but there is a structural function: the distribution of stress, organisation of drainage, formation of boundaries and recording of geological processes. Geological fractality demonstrates that self-similarity may arise not only through growth, but also through destruction, compression, folding and the interaction of matter with its environment.

In the cosmos, fractality becomes the largest-scale and most cautiously applicable category. Nebulae, gas-and-dust clouds, galactic structures, spiral arms, filamentary distributions of matter, star-forming regions and shell-like forms may display indications of recurrence across scales, centred organisation, layering, radiality and spirality. The cosmic level requires especially rigorous methodology, however, because images of the cosmos frequently possess great aesthetic expressiveness and may readily provoke excessive analogies. Cosmic fractality must therefore be treated as an object of analysis rather than as ready-made evidence.

Fractality within the hypothesis of the Matrix thus connects three levels: biological, geological and cosmic. In biology, it demonstrates the living self-similarity of growth and function. In geology, it demonstrates the self-similarity of dense matter, pressure and time. In the cosmos, it demonstrates the possible multiscale organisation of rarefied matter, gravity and energetic processes. There is no direct identity between these levels, but comparison according to structural features remains possible. It is precisely this that makes fractality one of the principal languages of the hypothesis.

The distinction between a mathematical fractal and natural fractality is particularly important. A mathematical fractal may be constructed according to a rigorous rule, repeated infinitely and preserve exact self-similarity at every scale. Nature operates differently. Its fractality is constrained by material, energy, environment, time, function and chance deviations. A tree does not branch infinitely. A vascular network has a lower limit of diameter. A river system is constrained by relief and climate. A coastline changes over time. A nebula disperses. Natural fractality is therefore always finite, approximate and historical.

It is precisely this approximate character that makes natural fractality especially valuable to the hypothesis. The Matrix must not be understood as an ideal mathematical figure recurring without

deviations. If the term is used as a scientific and philosophical model, the real Matrix must be manifested through specific natural processes—and therefore through variability, asymmetry, disruption, resistance, environment and history. Natural fractality demonstrates not lifeless replication, but living or processual recurrence. The same principle returns, but differently each time.

This makes it possible to clarify the concept of an invariant itself. An invariant is not an unchanging form in the literal sense. It is a stable principle preserved through changes in conditions, scale and material. The form may change, but its organisational principle remains recognisable. Branching, for example, may be botanical, vascular, fluvial, fracture-related, electrical, cosmic and filamentary, or symbolic. It is not the same physical process in each case, but it always expresses a transition from the one to the many and from a principal direction to a system of distribution. It is precisely such a principle that may be called a morphogenetic invariant.

Fractality as an invariant means that this principle may recur within form itself. Branching itself branches. A layer contains smaller layers. An edge divides into smaller edges. A spiral continues its own rhythm. A network creates subnetworks. A centre may generate secondary centres. Unfolding may recur within parts of an unfolded structure. Such self-repetition makes form not merely complex, but hierarchically organised. Fractality is therefore not a separate feature alongside others, but a means by which they unfold across scales.

Within the hypothesis of the Unified Matrix of the Universe, this may be expressed as follows: the Matrix is manifested not only through the presence of a centre, axis or branching, but also through the capacity of these features to recur at different levels. There may be more than one centre; smaller centres may arise within a larger structure. An axis may generate lateral axes. A branch may become a new axis for smaller branches. A layer may contain its own internal layering. An edge may possess micro-edges, serrations, scallops and secondary contours. Such nesting and recurrence create a multiscale form.

Fractality is therefore closely connected with the model of ‘leaf-like unfolding’. A leaf is not merely a surface, but a system of axes, veins, edges and recurrent levels of distribution. Its central vein establishes the principal order, its lateral veins create secondary directions, its smaller veins form a network, and its edge records interaction with the external environment. Each level does not mechanically copy the preceding one, but continues its principle. The leaf becomes a model of fractal unfolding: from centre and axis to network, from network to periphery, and from periphery to active edge.

The ‘circle-seed’ model may likewise be connected with fractality. A seed contains the potential of an entire form, but in the process of development this potential does not simply increase in size. It unfolds repeatedly through successive levels: root, stem, branches, leaves, flowers, fruits and new seeds. Each stage contains the possibility of further repetition. In this sense, the biological cycle is itself fractal in the broad philosophical meaning of the term: the beginning returns at the end, but at a new level; the whole reproduces itself through a part; the seed becomes a plant, and the plant creates many seeds, each of which bears the principle of the whole.

Fractality must not, however, be reduced to cyclicality alone. A cycle may recur in time, whereas fractality recurs in space and scale. In nature, however, the two are frequently connected. The development of form over time creates self-similar structures in space. The repetition of stages may generate the repetition of forms. Tree branching takes place over time but produces spatial fractality. A river network forms over time but becomes fixed as a self-similar structure in the

landscape. Stone texture takes shape over time but is preserved as a pattern. A cosmic cloud develops over time but becomes a visible spatial configuration. Fractality is therefore the spatial record of a process.

For the scientific development of the hypothesis, it is important to determine how fractality can be tested. At the first level, this involves the visual identification of self-similarity: observing recurrent structures at different scales. At the second level, it involves morphological classification: recording types of branching, layering, edges, networks, radiality and spirality. At the third level, it involves quantitative analysis: calculating fractal dimension, contour analysis, spectral analysis, box-counting, comparison of scaling regularities and computer recognition of structures. Only by combining these levels will it be possible to make fractality an operational concept rather than merely an expressive metaphor.

It is especially important to use independent samples. If a researcher selects only images that visually support the hypothesis, the result will be weak. Serious testing requires datasets from different fields: botanical images, vascular networks, terrain maps, river basins, satellite imagery, and images of nebulae and galaxies. The same analytical criteria must then be applied to them. Only in this way can it be established whether fractal features recur consistently or whether the result is merely a selective visual analogy.

Fractality also requires differentiation among levels of evidential status. In biology, self-similarity may be associated with the function and development of the organism. In geology, it may be associated with measurable structures of relief, faults, coastlines and river networks. In the cosmos, it may be associated with the analysis of the distribution of matter, brightness, filamentary structure and clustering. In culture, it may be associated with recurrent symbolic structures, ornaments, mandalas, the World Tree and sacred geometry. Cultural fractality, however, possesses a different status: it concerns not physical form generation, but the symbolic organisation of an image. It cannot be used as empirical evidence, but may be considered as philosophical and hermeneutic material.

The cultural level is particularly interesting because many ancient symbols employ nesting, repetition, a centre, radiality and a levelled structure. Mandalas, rose windows, the Shri Yantra, the World Tree, ornaments, star-shaped compositions and crop circles as graphic schemes may all display fractal-like principles. In these cases, however, the forms are created consciously or through tradition. They demonstrate that human thought also tends to record the world through recurrent structures. Within the hypothesis of the Matrix, this is significant as a cultural record of an observed order of form, but not as scientific evidence.

Fractality as an invariant must therefore be divided methodologically into several types. The first is rigorous or quantitatively confirmable fractality, for which mathematical analysis is possible. The second is natural self-similarity, in which recurrent features can be observed but are approximate and limited. The third is fractal-like morphology, in which a structure resembles a fractal principle but requires further verification. The fourth is symbolic fractality, in which the recurrence of levels is used within a cultural form. This distinction prevents different degrees of evidential support from being conflated.

Within the hypothesis of the Unified Matrix of the Universe, fractality performs several functions. First, it demonstrates the relationship between part and whole. Second, it explains how complexity may arise through the repetition of simple rules. Third, it connects different scales of matter. Fourth, it enables a transition from visual analogy to measurable parameters. Fifth, it

supports the concept of morphogenetic invariants by demonstrating that the same structural principle may recur under different conditions.

Fractality also has its limitations. Not every form is fractal. Not every complexity constitutes self-similarity. Not every recurrence possesses universal significance. Some resemblances may be coincidental. Some forms may arise through entirely different processes that produce externally similar contours. Some structures may be fractal only within a narrow range of scales. The hypothesis must therefore account not only for supporting examples, but also for the limits of applicability. This is a necessary condition of scientific integrity.

Fractality must not replace causal analysis. If a river network and vascular system both possess a branching character, this does not mean that they arose from the same cause. Morphological resemblance must be distinguished from causal identity. Morphological resemblance permits a question to be posed, but causal explanation remains the responsibility of the relevant science: biology, hydrology, geology or astrophysics. The hypothesis of the Matrix may function as a meta-theoretical language of comparison, but not as a substitute for specific disciplines.

It is nevertheless precisely fractality that makes this meta-theoretical language possible. Without self-similarity, comparison between forms at different scales could easily become a subjective analogy. Fractal geometry demonstrates that recurrence across scales may be a real property of natural systems. It provides grounds for arguing that part and whole are connected not only philosophically, but also structurally. Fractality is therefore one of the strongest scientific bridges between the hypothesis of the Matrix and contemporary knowledge of nature.

Philosophically, fractality returns us to the ancient idea of correspondence between the small and the large, but translates it into more rigorous terms. Traditional cultures frequently expressed this idea symbolically: microcosm and macrocosm, the tree as a model of the world, the circle as wholeness, the star as an unfolded centre, and the seed as the beginning of the whole. The modern concept of fractality allows such ideas to be considered more cautiously—not as a ready-made mystical truth, but as a possible cultural anticipation or figurative expression of a real property of natural forms: the recurrence of organisation at different scales.

Fractality thus connects the scientific and philosophical levels of the hypothesis without conflating them. The scientific level requires measurement, models and analysis. The philosophical level considers the relationship between part and whole, scale and form, repetition and difference. The morphological level compares specific structures. The cultural level demonstrates how human beings recorded analogous principles symbolically. Taken together, these levels make fractality one of the central concepts of the entire study.

For the further development of the hypothesis, the following definition should be established: within the Unified Matrix of the Universe, fractality is understood as the recurrence of the organisational principle of form at different scales, in which a part reproduces the structural logic of the whole and the whole is manifested through a hierarchy of self-similar elements. This definition does not require literal correspondence between forms and does not assert a single physical mechanism for every object. It identifies precisely a morphogenetic invariant—the recurrence of a mode of organisation.

This understanding makes it possible to use fractality as one of the principal criteria of analysis in subsequent sections of the study. When examining flowers, leaves, stones, landforms, nebulae, galactic structures, artefacts, the World Tree, Sumerian bas-reliefs, sacred geometry and crop circles, it will be necessary to ask: Is self-similarity present here? At what level? How is

it expressed? Is it rigorous, approximate, fractal-like or symbolic? Can it be measured? What function does it perform within the form? Is it connected with a centre, axis, layer, branching, radiality or unfolding?

It is precisely such questions that transform fractality from an attractive term into a research instrument. Within the hypothesis of the Unified Matrix of the Universe, fractality becomes not evidence in itself, but one means of testing and refining the hypothesis. If fractal and self-similar features are consistently identified in different systems, the hypothesis will acquire a substantial basis for further development. If they prove to be particular or coincidental, the limits of the hypothesis must be revised. This is the scientific value of the concept: it permits testing.

Fractality may consequently be called the language of the Matrix because it demonstrates how a single principle can manifest itself through a multiplicity of forms without eliminating their differences. It explains why the world can be reduced neither to chaos nor to mechanical uniformity. Nature creates forms that are recognisable by principle but unique in detail. The part bears the trace of the whole without copying it literally. Scale changes, but the structural logic may be preserved. It is precisely this that makes fractality one of the key foundations of the hypothesis of the Unified Matrix of the Universe.

The chapter on fractality concludes the first major theoretical section of the study. The preceding chapters examined form as a philosophical category, self-organisation as a principle through which order arises, and morphogenesis as the process of form's becoming. Fractality—the language of recurrence across scales and self-similarity—has now been added to these concepts. Together, they create the foundation for the transition to the next part of the study, in which the hypothesis of the Unified Matrix of the Universe itself, its concept, key models and staged scheme of the unfolding of form will be formulated.

Part Two

Formulation of the Hypothesis of the Unified Matrix of the Universe

Chapter Five

The Concept of the Matrix

5.1. What the ‘Matrix’ Means in Scientific and Philosophical Terms

The transition to the second part of the study marks a movement from theoretical foundations to the actual formulation of the hypothesis of the Unified Matrix of the Universe. The preceding chapters examined four key areas: form as a philosophical category, self-organisation as a principle through which order arises, morphogenesis as the process of form’s becoming, and fractality as a language of self-similarity. It is now necessary to define the central concept of the entire hypothesis—the concept of the Matrix. Without such a definition, the discussion that follows could easily be misunderstood as a mystical assertion, a metaphor devoid of scientific content or an arbitrary unification of unrelated phenomena. The first step must therefore be strictly conceptual.

In scientific and philosophical terms, the Matrix in the present hypothesis is not an object. It cannot be conceived as a thing concealed within nature, as a special substance, material, field or physical structure existing separately from particular systems. Nor should the Matrix be understood as a mystical entity governing the world from outside. Such an interpretation would immediately remove the hypothesis from the domain of scientific and philosophical analysis and transform it into speculative metaphysics. In the present book, the Matrix is understood differently: as a hypothetical universal principle of the structural organisation of form.

This definition requires detailed clarification. The word ‘matrix’ possesses different meanings in different fields of knowledge. In mathematics, a matrix is a system of elements arranged in rows and columns. In engineering and manufacturing, a matrix or mould may denote a form used to produce an object. In biology, a matrix may denote a foundation, medium or structure upon which development, synthesis or organisation occurs. In cultural theory, a matrix is sometimes understood as a concealed scheme that establishes an order of meanings. In the present hypothesis, the word ‘Matrix’ is used not in any one of these narrow senses, but in an extended scientific and philosophical sense: as a model of the structural logic through which form may arise, unfold, recur and stabilise.

The Matrix is consequently not a finished blueprint of the world. It does not mean that all objects are constructed in advance according to a single geometrical scheme. Nature is too diverse to be reduced to one pattern. A leaf, stone, nebula, river, flower, vascular network, galaxy and cultural symbol possess different mechanisms of origin, scales, materials and functions. The Matrix does not negate these differences. On the contrary, its purpose is to identify potentially recurrent principles of organisation that may be manifested in different systems without reducing those systems to the same thing.

In this sense, the Matrix is a structural rather than a material concept. It refers not to ‘what’ the world is made of, but to ‘how’ form is organised. Its subject is not substance, but order; not material, but the way in which elements are connected; not an individual object, but a recurrent

logic of form generation. In more rigorous terms, the Matrix may be defined as a hypothetical system of morphogenetic invariants describing the transition from a potential state to a manifested form through centred organisation, axial organisation, symmetry breaking, layering, branching, radiality, spirality, an active edge, self-similarity and cyclical reproduction.

This understanding makes it possible to avoid one of the principal errors: transforming the Matrix into an object of belief. The hypothesis must not assert that ‘the Matrix exists’ in the same sense in which a stone, cell, planet or star exists. A more appropriate formulation is that ‘the concept of the Matrix may be used as a model for describing recurrent principles of form generation’. This distinction is fundamental. An object must be discovered as a thing. A model must be tested through its explanatory power, internal consistency, applicability to the material and capacity for refinement.

In scientific and philosophical terms, the Matrix is closer to a theoretical construct. A theoretical construct is not an arbitrary fantasy. It is created to connect multiple observations that would otherwise remain disparate. Centred forms, branching structures, layered bodies, spirals, radial unfoldings, self-similar networks and active edges are observed in different domains of nature. Each particular science explains these phenomena through its own mechanisms. Biology speaks of tissue growth and the functions of organisms. Geology speaks of pressure, erosion, faults and time. Cosmology speaks of gravity, gas, dust, radiation and rotation. The Matrix as a hypothesis poses the question of whether a common morphological language can be distinguished above these particular explanations.

The Matrix therefore does not compete with biology, geology, physics or cosmology. It must not replace specific scientific explanations. It cannot be said that a leaf possesses veins ‘because the Matrix is operating’ when biology already explains leaf development through tissue growth, genetic regulation, hormonal signals, vascular function and interaction with the environment. Nor can it be said that a river network branches ‘because the Matrix is operating’ when hydrology and geomorphology explain it through drainage, gradient, erosion and the structure of relief. The Matrix is not an alternative to these explanations. It constitutes a level at which their morphological results can be compared.

The Matrix must therefore be understood as a meta-level of analysis. The individual sciences study specific mechanisms. The hypothesis of the Matrix studies potentially recurrent structural principles manifested in the results of these mechanisms. This meta-level is not above science in authority, but is broader in scope. It does not speak in place of the disciplines; it connects their findings through a language of form. This is why the concept of the Matrix must remain scientific and philosophical: it unites empirical material, morphological comparison and philosophical reflection upon order.

It is also important to distinguish the Matrix from a simple metaphor. A metaphor may be striking without necessarily providing a research instrument. To state that a flower resembles a nebula may produce an attractive image, but it is not yet a scientific proposition. If, however, specific features are identified—a centre, radiality, layering, an active edge, unfolding, asymmetrical variations and the relationship between internal and external—and their manifestations in different objects are then tested, a research procedure emerges. The Matrix becomes not an embellishment of the text, but an analytical instrument.

The concept of the Matrix is associated above all with form, but not with form as an external contour. In this context, form is understood as the organisation of matter, energy, space, direction, boundaries and interactions. The Matrix therefore concerns not the surface, but the

principle of structuring. A flower is significant not only because of its petals, but because of the way it opens from a bud, organises centre and periphery, repeats modules, combines layers and participates in the cycle of the seed. A leaf is significant not only because of its outline, but because of the transition from axis to a network of veins and an active edge. A stone is significant not only because of its pattern, but because it records layers, cracks, stresses and the history of matter. A nebula is significant not only because of its aesthetic beauty, but because of the way matter forms a centre, shell, filaments and periphery.

In this sense, the Matrix may be described as a principle of morphogenetic organisation. It concerns the process through which form arises, not only the finished form. The finished object is a result. The Matrix describes the logic of transition: how the potential becomes manifested; how homogeneity is disrupted; how a centre appears; how an axis arises; how layers form; how structure branches or unfolds; how the periphery acquires an active edge; how a part begins to reproduce the principle of the whole; and how a completed form becomes the foundation of a new cycle. It is this processual character that distinguishes the Matrix from a static scheme.

The connection between the Matrix and the concept of potential is especially significant. In many natural processes, form does not appear immediately as a completed structure. It exists in a concealed, folded or potential state. A seed contains the possibility of a plant. A bud contains the possibility of a flower. A crystal may begin to grow from a nucleus of crystallisation. A geological fold arises from concealed stress within rock. A crack reveals an internal distribution of forces. A nebula or gas cloud may contain potential zones of condensation and future star formation. In this context, the Matrix may be understood as a model of the transition from concealed potential to manifested organisation.

This potential must not, however, be mystified. Potential is not a secret programme in a supernatural sense. In biology, it is associated with genetic information, cellular state, environment and regulatory processes. In geology, it is associated with the properties of matter, pressure, temperature, time and external conditions. In the cosmos, it is associated with mass, density, gravity, rotation, radiation and gas dynamics. In culture, it is associated with symbolic traditions, material, technique and imagination. The Matrix describes not potential itself as a substance, but the recurrent logic of its unfolding into form.

The Matrix cannot therefore be reduced to genetic code. Genetic code is a biological mechanism for transmitting information and synthesising proteins. It belongs to living systems. Within the hypothesis, the Matrix possesses a broader status. It may be described as a ‘code’ only in a figurative, structural sense, if code is understood as an algorithm or order governing the unfolding of form. It is not genetic code in the strict biological sense. This distinction will be especially important later, because the concept of a ‘morphogenetic code’ must be developed not as biological reductionism, but as a model of structural sequence.

In scientific and philosophical terms, the Matrix may be presented as a response to the question of why similar forms arise in different systems. This question has no simple answer. One possible answer is chance: some resemblances may indeed be coincidental. Another is subjective perception: human beings may perceive similar images where no objective structure exists. This factor also operates. A third possibility is that common physical or mathematical constraints cause different systems to arrive at similar forms because comparable principles of optimisation, distribution, stability, self-organisation and symmetry breaking are at work. It is this third possibility that is most important to the hypothesis of the Matrix.

Branching, for example, may arise in biology, hydrology, cracks, electrical discharges and neural networks not because all these systems share one substance, but because branching provides an effective means of distributing a flow, stress, signal or growth. A spiral may arise in different systems not because they are mystically connected, but because rotation, growth, gradients and centre–periphery organisation frequently produce spiral configurations. Layering may arise because processes proceed in stages and preserve traces of preceding states. Radiality may arise where a centre and propagation towards a periphery are present. Fractality may arise where the same process is repeated at different scales.

Understood in this way, the Matrix is not a cause in the narrow physical sense, but a principle for describing general conditions of form generation. It does not replace causality; it connects different types of causation through their common morphological results. The cause is one thing in biology, another in geology, a third in the cosmos and a fourth in culture. The structural result may nevertheless be comparable. It is this that makes it possible to speak of the Matrix as a hypothetical universal principle of the structural organisation of form.

The universality of the Matrix must consequently not be understood as uniformity. This is a crucial point. The universal need not be homogeneous. On the contrary, a genuinely universal principle may manifest itself in numerous ways. If the Matrix produced identical forms, the world would be monotonous. Yet observed nature is diverse. The hypothesis must therefore explain not sameness, but the relatedness of structural solutions while preserving their differences. The Matrix is a language of organised diversity, not a scheme of mechanical repetition.

This approach makes it possible to include the concepts of variability and asymmetry within the hypothesis. Real forms are rarely perfectly symmetrical and rarely reproduce one another completely. Flowers of the same species differ. Leaves on the same tree are not identical. Stones of the same type possess different textures. River systems differ from basin to basin. Nebulae are unique. Yet common features may persist within these differences: a centre, axis, branching, layers, an edge, radiality, spirality and self-similarity. The Matrix is manifested not through the elimination of variations, but through their structural ordering.

The Matrix must also be understood dynamically. It is not a static scheme, but describes a process. At the centre of the hypothesis lies not a finished form, but the unfolding of form. The Matrix is therefore associated with transitions such as: concealed–manifested; centre–periphery; symmetry–symmetry breaking; axis–branching; layer–multilayered organisation; contour–active edge; part–whole; completion–new beginning. These transitions make it possible to describe form generation as a succession of stages rather than as the instantaneous appearance of an object.

In this respect, the Matrix is close to the concept of an algorithm, but only in an extended morphological sense. An algorithm need not be a computer programme. Broadly understood, it is a sequence of operations or rules leading to a result. The morphogenetic Matrix may be understood as a conditional algorithm for the unfolding of form: an initial nucleus or centre, the emergence of an axis, the disruption of homogeneity, the formation of layers, branching, the unfolding of the periphery, the formation of an active edge, stabilisation and possible reproduction. This is not a single scheme applicable to every object, but a working model to be tested against the material.

The concept of the Matrix also requires three levels of evidential support to be distinguished. The first is scientific and theoretical. It is associated with existing theories of self-organisation, morphogenesis, fractality, reaction–diffusion processes, mechanochemical and bioelectric

models, complex systems and non-linear dynamics. This level demonstrates that form can genuinely arise through a system's internal processes. The second level is comparative and morphological. It involves the analysis of similar structures in biology, geology, the cosmos and other fields. The third level is philosophical and hermeneutic. It involves cultural symbols, artefacts, the World Tree, sacred geometry and historical images of form. The Matrix may be discussed on all three levels, but they must not be conflated.

This distinction is particularly important because cultural forms frequently possess great expressive power. Ancient symbols of the circle, tree, flower, star, lotus, world axis, mandala or spiral may appear to provide direct confirmation of the hypothesis. Strictly speaking, however, they do not constitute scientific evidence. They belong to the cultural and hermeneutic level. They may be analysed as evidence that human consciousness recorded stable forms of order, but they cannot be used in place of biological, geological or physical explanations. The Matrix as a scientific and philosophical model must preserve this distinction.

A further indication of a correct understanding of the Matrix is the rejection of totality. The hypothesis must not claim that absolutely every form in the Universe directly and clearly expresses the same Matrix. Such an assertion would be excessive and untestable. A more rigorous position is that particular morphogenetic invariants may be manifested in different systems and may permit interpretation within a common model. Where these invariants are strongly expressed, the material is suitable for analysis. Where they are weak or absent, the hypothesis must acknowledge this.

In other words, the Matrix must possess limits of applicability. This is an essential condition of scientific seriousness. A theory that explains everything without exception often explains nothing in particular. The hypothesis of the Unified Matrix of the Universe must therefore distinguish suitable from unsuitable cases. An object may display a centre, radiality and layering without self-similarity. Another may possess branching without a clearly expressed centre. A third may resemble a flower visually, but analysis may reveal only weak structural correspondence. Such analytical discipline is essential to the development of the hypothesis.

The Matrix as a concept is also connected with the problem of scale. One of the main foundations of the hypothesis is that similar structural principles may be manifested at micro-, meso- and macro-levels. In biology, these may include cellular structures, tissues, organs, plants and networks. In geology, they may include stone textures, cracks, landforms, river systems and mountain ranges. In the cosmos, they may include nebulae, stellar clouds, galaxies and large-scale structures of matter. The Matrix becomes an operational concept only if it can account not merely for one scale, but for transitions between scales.

Fractality plays a central role here. If a part reproduces the principle of the whole, the Matrix may be described as a scalable logic. Scalability does not, however, imply infinity. Real natural systems always possess physical, biological, energetic, spatial and temporal limits. The Matrix is therefore manifested not as an infinite mathematical construction, but as finite natural organisation. It operates within ranges rather than in absolute infinity. This clarification protects the hypothesis from excessive generalisation.

The scientific and philosophical understanding of the Matrix also presupposes that it is an open model. It cannot immediately be declared a completed theory. It must develop through the clarification of concepts, classification of features, image analysis, comparison of materials, quantitative methods and criticism. If new data demonstrate that a particular feature is not universal, the model must be revised. If new invariants are identified, the model may be

expanded. If certain analogies prove weak, they must be excluded or assigned a lower level of evidential support.

This makes the hypothesis investigative rather than dogmatic. The Matrix is not a final answer, but a means of posing a question. The central question may be formulated as follows: do recurrent principles of form generation exist that are manifested in biological, geological, cosmic, and cultural and symbolic systems, and can they be described through a common morphogenetic language? The hypothesis offers a preliminary answer: such principles probably exist, and the concept of the Matrix may serve as a model for describing them. The degree of universality of this model must, however, be tested.

In scientific and philosophical terms, therefore, the Matrix is not a thing, a material, a hidden substance or a mystical centre of the world. It is a hypothetical universal principle of the structural organisation of form, permitting the transition from potentiality to manifestation, from centre to periphery, from symmetry to differentiation, and from simple structure to multilayered and self-similar organisation to be described. It is a model, a language and a research instrument—not an object of veneration or an arbitrary metaphor.

This understanding makes it possible to proceed to the next section—the Matrix as a morphogenetic code. It will be necessary there to clarify that the word ‘code’ is likewise used not in the narrow genetic sense, but as a designation for a structural algorithm governing the unfolding of form: centre, axis, layers, branching, periphery and reproduction. If the present section has defined the Matrix as a principle, the next must elucidate it as an order of successive form generation.

5.2. The Matrix as a Morphogenetic Code

Having defined the Matrix as a hypothetical universal principle of the structural organisation of form, it is necessary to clarify how this principle may be described. One of the most productive concepts here is that of a morphogenetic code. It must immediately be emphasised, however, that within the present hypothesis the word ‘code’ is not used in the narrow biological and genetic sense. The discussion does not concern genetic code, DNA, hereditary information or the molecular mechanisms of protein synthesis. These meanings belong to biology and cannot be transferred mechanically to geology, cosmology or cultural forms. In the present section, code is understood more broadly—as a structural algorithm governing the unfolding of form.

This understanding makes it possible to speak of the Matrix not as a static scheme, but as a succession of morphogenetic transitions. Form does not arise immediately as a completed structure. It passes through stages: from a potential state to manifestation, from centre to axis, from axis to layers, from layers to branching, from branching to periphery, from periphery to an active edge, and from completed form to the possibility of renewed reproduction. It is this sequence that may be described as the morphogenetic code of the Matrix.

Here the word ‘code’ refers not to substance, but to order. A code is a means of organising transitions. It need not be inscribed within a single material bearer. It is realised differently in different systems: in a living organism, through cells, tissues, genes, chemical signals, mechanical stresses and bioelectric fields; in geology, through pressure, layers, faults, crystallisation, erosion and time; in the cosmos, through gravity, rotation, density, radiation, gas

dynamics and magnetic fields; and in culture, through symbol, composition, material, canon and recurrent imagery. In every case, however, it is possible to investigate whether a recurrent logic of form generation exists.

The morphogenetic code of the Matrix may provisionally be represented as the following sequence:

centre → axis → layers → branching → periphery → reproduction

This scheme should not be understood literally or identically for every object. It is an analytical model that makes it possible to describe different forms through recurrent stages of organisation. In some systems, all these elements are expressed clearly. In others, only some are present. In still others, the sequence may be disrupted, partial or transformed. The scheme nevertheless establishes a language through which biological, geological, cosmic and cultural structures may be compared.

The first element of this code is the centre. The centre constitutes the beginning of the organisation of form. It may be a seed, nucleus, growth point, region of crystallisation, area of pressure, gravitational concentration, centre of a nebula, galactic nucleus, compositional focus of a symbol or sacred middle of an image. The centre is not always a geometrically precise point. It may be expressed as a zone, region, node, core, condensation, source or initial condition. Its significance lies in form beginning to organise itself around or from it.

The centre in the morphogenetic code Is not an absolute locus of authority governing everything from outside. It is instead a region in which potential is concentrated. In a seed, the centre is associated with the possibility of a future plant. In a bud, with the future opening of the flower. In crystallisation, with the beginning of the ordering of matter. In geological deformation, with a zone of stress or the core of a fold. In cosmic form, with a region in which matter or an energetic process is concentrated. In a cultural composition, with a point of semantic organisation. The centre establishes the possibility of form, but does not yet constitute the entire form.

The second element is the axis. Whereas the centre concentrates potential, the axis establishes direction. Without an axis, form may remain closed, unfolded and unoriented. The axis transforms potential wholeness into a process. In a plant, it is manifested as a root, stem, the central vein of a leaf or the vertical direction of growth. In an embryo, as the spatial polarity of the body. In geology, as the line of a fold, fault, ridge, valley, channel or directional stress. In the cosmos, as the direction of rotation, ejection, symmetry or a polar structure. In culture, as the vertical of the World Tree, a column, a central shaft or a line connecting levels.

The axis is of fundamental importance because It disrupts the initial equivalence of space. As long as every direction is equivalent, form has not yet acquired orientation. The emergence of an axis means that one direction becomes primary. Lateral lines may extend from it, layers may form around it, and growth or deformation may proceed along it. The axis gives form directionality. Within the morphogenetic code of the Matrix, it should therefore be understood as the first act of spatial differentiation.

The third element is layers. Layering demonstrates that form develops not instantaneously, but in stages. A layer is a trace of sequence. In biology, this may take the form of a bud with overlapping petals, the tissue layers of an embryo, the envelopes of a fruit, the growth rings of a tree, layers of skin or the membranes of organs. In geology, it may take the form of sedimentary strata, folded structures, mineralogical bands, lava flows, crystalline zones, and glacial or volcanic deposits. In the cosmos, it may take the form of nebular shells, regions of different

density and brightness, expansion fronts, rings and waves of matter. In culture, it may appear as nested circles, levels of a mandala, tiers of the World Tree or recurrent contours within an ornament.

A layer is connected with the memory of form. Each layer records a particular state or stage of a process. In a living system, a layer may result from tissue differentiation. In stone, it may result from sedimentation, pressure or chemical change. In a nebula, it may be a trace of expansion, ejection or the distribution of matter. In a symbol, it may represent a level of meaning and composition. Layering is therefore one of the principal features of morphogenetic history. It demonstrates that form possesses a past rather than merely an external appearance.

The fourth element is branching. Branching constitutes the transition from a single direction to multiplicity. If the axis establishes the principal vector, branching unfolds the system through space. In biology, this appears in tree branches, roots, leaf veins, vascular systems, the bronchial tree, neural structures and coral forms. In geology, it appears in river networks, faults, cracks, ravines, lava flows and submarine canyons. In cosmic morphology, it is possible to speak cautiously of filamentary, thread-like, cloud-like and network structures in the distribution of matter. In culture, branching appears in images of the tree, ornamental systems, genealogical diagrams and sacred verticals with ramifications.

Branching demonstrates that form does not remain simple. It creates multiple directions, but these directions are not chaotic. They are connected with the original axis, centre or flow. Branching allows a system to distribute matter, energy, signals, stress, movement or meaning. It is therefore not only a geometrical feature, but also a functional principle. In living organisms, it serves nutrition, respiration, connection and growth. In geology, it distributes water or stress. In culture, it distributes semantic levels. Branching makes form multiple while preserving its connection with the whole.

The fifth element is the periphery. The periphery should not be understood as a secondary remainder of form. In morphogenesis, it is the zone in which unfolding reaches its external limit and enters into active interaction with the environment. The edge of a leaf, the petal of a flower, a coastline, the front of a crack, the boundary of a cloud, the contour of a nebula, the external layer of an artefact and the outer line of an ornament all demonstrate that the periphery is not passive. It is a site of contact, exchange, resistance, destruction, growth and visible completion.

The active edge is one of the most important features of the morphogenetic code. It is often at the Edge that the complexity of form becomes visible. The edge may be smooth, undulating, serrated, scalloped, ruptured, branching, layered, spiral or radial. It demonstrates how the system's internal organisation encounters external conditions. In biology, this is contact with air, light, water or other tissues. In geology, it is contact between water and land, pressure and surface, crack and rock. In the cosmos, it is the interaction of a cloud with radiation, a shock wave or the interstellar medium. In culture, it is the boundary of composition and semantic form.

The sixth element is reproduction. In the biological sense, reproduction is connected with the life cycle:

seed → plant → flower → fruit → new seed

The morphogenetic code is manifested most fully here because a completed form creates a new potential form. In an extended sense, however, reproduction need not mean biological propagation. It may signify the transition of a completed structure into the material or condition of a new form. Geological rock breaks down and becomes sediment for new strata. A volcanic

flow solidifies and becomes part of a new landscape. Cosmic matter following stellar processes may participate in new structures. A cultural symbol is reproduced in new images, rituals, ornaments and architectural forms.

Reproduction within the morphogenetic code of the Matrix should therefore be understood on two levels. In the narrow biological sense, it is the continuation of life through a new generation. In the broad morphological sense, it is the capacity of a form or its result to become the foundation of new form generation. The completion of one cycle becomes the beginning of another. This is particularly important to the 'circle-seed' model: the circle or seed functions as a potential wholeness from which form unfolds and to which it subsequently returns as a new potentiality.

The sequence centre → axis → layers → branching → periphery → reproduction is not a mechanical chain identical for every object. In real systems, these elements may arise simultaneously or partially, with feedback, disruptions and deviations. In biological development, for example, axes, layers and gradients may form in parallel. In geology, cracks may arise before clear layering, or vice versa. In cosmic structures, centre and periphery may be dynamically unstable. In culture, a compositional centre may be established immediately, while branching and layering are added symbolically. The morphogenetic code should therefore be understood not as a rigid chronology, but as a structural grammar.

The concept of grammar is especially appropriate here. In language, grammar does not dictate a single sentence, but establishes rules according to which different utterances may be constructed. Similarly, the Matrix as a morphogenetic code does not produce only one form. It establishes a set of relationships from which different forms may arise. Centre, axis, layer, branching, periphery and reproduction may be combined in different ways. Radiality may predominate in one object, branching in another, layering in a third, spirality in a fourth and the active edge in a fifth. All may nevertheless be described within a common morphological grammar.

This makes it possible to speak of the Matrix as a code of organised diversity. The code does not eliminate differences. On the contrary, it makes difference possible within order. If the code were too rigid, all forms would be identical. If no code existed at all, forms would disintegrate into a chaos of random configurations. Nature reveals something else: an immense diversity of forms in which certain principles nevertheless recur. The morphogenetic code of the Matrix must explain precisely this—how diversity can be structurally related rather than chaotic.

In biology, this relationship is especially evident. Different plants possess different leaves, flowers, fruits, roots and stems, but many use similar principles: axial growth, branching, venation, layering within the bud, the opening of the flower, fruiting and return to the seed. Different organisms possess different vascular systems, but the principle of distribution from larger channels to smaller ones recurs. Different neural structures are unique, but retain their network-like character. This permits discussion of a biological code of form in a broad morphogenetic sense without reducing it to DNA.

In geology, the code is manifested differently. There is no seed or biological growth, but there are centres of stress, axes of folding, rock strata, branching cracks and river networks, active edges of coasts and faults, and cycles of destruction and renewed accumulation. The geological code of form is slow, dense and materially weighty. It operates through time, pressure and environment. Considered morphologically, however, comparable structural transitions may be

observed: concentration → direction → layering → faulting or branching → edge → a new stage of formation.

In the cosmos, the morphogenetic code acquires a still greater scale. A centre may be a gravitational concentration, stellar region, galactic nucleus or source of ejection. An axis may be manifested through rotation, polar structures or the direction of flows. Layers may appear as shells, rings, density regions and expansion fronts. Branching may appear through filamentary and cloud-like structures. The periphery may appear through the edges of nebulae, galactic arms, outer shells and rarefied regions. Reproduction in the biological sense is absent, but matter may pass from one cosmic form to another and participate in new cycles of star formation and structuring.

Cultural systems translate the morphogenetic code into symbolic language. The World Tree combines a centre, axis, root, trunk, branches, levels, fruit and a connection among worlds. A mandala organises space around a centre and nested layers. The Shri Yantra constructs a complex composition through a centre, intersecting axes, nested triangles, radiality and periphery. Ornaments repeat motifs, creating self-similarity and rhythm. Architecture employs the centre, axis, tier, dome, column, portal, boundary and transitional space. Here the code is not a physical process, but becomes a means of symbolically structuring the world.

The morphogenetic code of the Matrix is therefore interdisciplinary. It does not belong exclusively to any one science. It is a language of comparison that makes it possible to observe how different systems address common structural tasks: where a centre arises, how direction is established, how levels form, how distribution occurs, where an edge appears, how form stabilises and how it becomes the foundation of a subsequent stage. In this sense, the code of the Matrix is not a particular formula, but a general model of transitions.

It is especially important to consider the relationship between this code and the A–B–C–D model proposed within the hypothesis. Stage A corresponds to an initial potential wholeness: a seed, circle, nucleus, centre, closed form or compact state. Stage B corresponds to the beginning of symmetry breaking and the emergence of direction: a shoot, axis, first line, crack, polarity or beginning of unfolding. Stage C corresponds to differentiation: layers, branching, veins, petals, folds, waves and internal levels. Stage D corresponds to a manifested structure: an open flower, formed leaf, river network, landscape, nebula, galactic spiral or cultural composition. A transition to a new A may follow stage D if the form creates a new potential beginning.

The A–B–C–D model makes it possible to understand the morphogenetic code not as a list of features, but as a process. A centre alone is not yet form. An axis alone is not yet a completed structure. A layer alone is not yet a whole. Branching alone is not yet stabilisation. Only a succession of transitions creates form as an unfolded organisation. The Matrix as code must therefore be understood processually: it describes not a list of elements, but their emergence, interconnection and transition into one another.

One important feature of the morphogenetic code is its non-linearity. A simple representation might suggest that a centre always appears first, followed by an axis, layers, branching and so forth. Real systems, however, are more complex. A centre may shift. An axis may bifurcate. Layers may form simultaneously with branching. The periphery may influence the centre. The edge may alter subsequent growth. A completed form may reorganise itself. The code of the Matrix is therefore not a straight line. It is closer to a network of transitions possessing a general logic while permitting feedback and variation.

This is particularly evident in living systems. A plant develops from a seed, but the environment constantly influences its form. Light alters the direction of growth. Wind affects the trunk and branches. Water and soil alter the root system. Damage may cause new branches to form. A flower may open with imperfect symmetry. A leaf may become deformed. Despite all this, the general morphogenetic code is preserved: the plant remains a plant, the leaf a leaf and the flower a flower. The code therefore permits deviation and adaptation.

Non-linearity is even more evident in geology. A river network may change its channel. A fault may be interrupted and subsequently resume. Layers may be deformed, bent or destroyed. A coastline may retreat or advance. A volcanic flow may divide, stop, solidify and be overlain by a new flow. Here the code is not a predetermined programme. It is manifested as a recurrent logic of the behaviour of matter under conditions of stress, movement and time.

In the cosmos, the morphogenetic code likewise does not constitute a simple sequence. Nebulae may be asymmetrical, ruptured and multicomponent. Galaxies may interact, deform, merge their arms, lose symmetry, and create bars and rings. Clouds of matter may fragment and subsequently condense again. If this term is used, therefore, the cosmic Matrix must be understood as a dynamic model of form generation rather than an ideal geometrical scheme.

It is precisely non-linearity that makes the concept of code both flexible and demanding. If the code is understood too rigidly, it cannot describe real forms. If it is understood too freely, it loses its analytical force. A balance must therefore be maintained: the morphogenetic code establishes stable structural transitions while permitting variability in their realisation. It is not a blueprint, but a generative rule; not a copy, but a grammar; not a prescription of every detail, but a system of relationships.

Scalability is one of the most important properties of such a code. The same principle may recur at different levels. A centre may exist within the object as a whole and within its parts. An axis may possess primary and secondary lines. Layers may contain internal layers. Branching may branch further. The periphery may possess its own micro-edges. Reproduction may create new centres. This scalability constitutes the fractal dimension of the morphogenetic code. The code does not merely unfold form once; it may repeat itself within the unfolded form.

The Matrix as code thereby connects morphogenesis and fractality. Morphogenesis explains how form arises in time. Fractality demonstrates how the principle of form recurs in space and at different scales. The code unites these two dimensions: the development of form creates a self-similar structure, while the self-similar structure preserves traces of development. The branching of a tree arises over time but is recorded in space. A river network forms over time but becomes a map of relief. The layering of stone accumulates over time but is visible as structure. A nebula develops dynamically but is observed as form.

The morphogenetic code is also connected with the concept of boundary. Every stage in the unfolding of form presupposes the emergence of a new boundary: the boundary of the centre, axis, layer, branch and periphery. A boundary not only separates, but also connects. It divides the internal from the external while simultaneously constituting a zone of interaction. The code of the Matrix therefore always includes an active edge. Without an edge, form cannot be complete because it does not enter into a relationship with its environment.

The periphery and edge are particularly important to understanding that the Matrix is not a closed system. Form is always in contact with the external. A seed requires an environment. A leaf requires light and air. A river requires relief and precipitation. A stone requires conditions of

pressure, temperature and weathering. A nebula exists within the interstellar medium. A symbol depends upon cultural perception. The morphogenetic code therefore cannot be entirely internal. It is always realised through interaction between internal potential and external conditions.

This clarifies an important proposition: the Matrix is not merely an internal programme. It is a structure of interaction. Form arises between internal and external, between potential and environment, between centre and periphery, and between stability and change. If the Matrix is understood as a code, this code encompasses not only what a system 'contains within itself', but also how it responds to conditions. The Matrix is therefore not a closed instruction, but an open algorithm of becoming.

Reproduction occupies a special place within the code. In biological form, it is evident: a seed produces a plant, and a plant produces seeds. In philosophical and morphological terms, however, reproduction signifies a broader principle: form generates a new possibility of form. This may be biological offspring, a geological cycle, the cosmic redistribution of matter or the cultural repetition of a symbol. In each case, a completed structure is not an absolute end. It may become a new beginning. The code of the Matrix therefore possesses a cyclical character.

Cyclicality does not mean a simple return to what came before. A new seed is not the same seed. A new rock layer is not the preceding layer. A new cultural interpretation of a symbol is not identical to the old one. A new cosmic process does not reproduce the previous one literally. Reproduction within the code of the Matrix is therefore a return with difference. This is a fundamental feature: form repeats a principle without copying a detail. Here the connection between code, fractality and self-similarity is again manifested.

The morphogenetic code of the Matrix may also be represented as a system of questions applicable to any object of analysis. Does the form possess a centre or region of concentration? How is its axis or direction expressed? Are layers, stages or levels present? Is there branching or distribution? How is the periphery organised? Is the edge active? Is self-similarity present? Can a transition from a closed to an open state be identified? Does the form produce a new cycle or become the foundation of a new form? These questions allow the concept of code to be employed in research practice.

This approach is particularly important in image analysis. Visual material may be impressive, but without a structured set of questions it remains merely illustrative. The morphogenetic code transforms an image into an object of analysis. In a flower, for example, it is possible to distinguish a centre, radiality, petal layers, the periphery and a connection with the seed. In a stone, one may distinguish layers, cracks, a centre of stress, growth or crystallisation lines and an active edge. In a nebula, one may distinguish a centre, shells, filaments, ruptures and peripheral contours. In the World Tree, one may distinguish an axis, root, branches, levels, fruit and the connection among worlds. In every case, the code establishes a method of reading form.

It must be remembered, however, that the code must not be imposed upon an object. If a particular form possesses no clearly expressed centre, one should not be invented artificially. If branching is absent, it cannot be declared concealed without grounds. If layering is not observed, it cannot be replaced with a metaphor. The morphogenetic code must be an instrument of testing, not a means of forcing the material to fit. It is this that distinguishes a scientific and philosophical hypothesis from arbitrary symbolic interpretation.

The Matrix as code also possesses predictive potential. If a centre, axis and initial layers have been identified in a particular system, it may be possible to hypothesise which forms of

subsequent differentiation may arise: branching, radiality, increasing peripheral complexity or an active edge. In biology, such predictions may concern the development of organs or tissues. In geology, they may concern the possible propagation of cracks or formation of channels. In modelling, they may concern patterns of self-organisation. Such prediction requires specific scientific data, but the very concept of code makes it possible to move from description to modelling.

In this respect, the morphogenetic code may provide a foundation for the future formalisation of the hypothesis. Its elements may be translated into parameters: the presence of a centre, degree of axial expression, number of layers, branching index, edge complexity, fractal dimension, radiality, spirality, degree of self-similarity and A–B–C–D stage. If such parameters are developed, the hypothesis of the Matrix will be able to move from philosophical description towards more rigorous comparative morphometry. This is especially important to its scientific prospects.

At the same time, the code of the Matrix retains philosophical significance. It makes it possible to understand form as the unfolding of the meaning of matter. Here 'meaning' need not denote human significance. It may refer to structural directionality: matter does not merely occupy space, but organises and differentiates itself, creating centres, edges, levels and connections. Form becomes a mode in which order appears. The morphogenetic code describes this order as a process in which the potential becomes visible, the internal becomes external, the one becomes many, and the completed becomes a new beginning.

The Matrix as a morphogenetic code is therefore a structural algorithm governing the unfolding of form and encompassing the centre, axis, layers, branching, periphery and reproduction. This code is neither genetic code in the biological sense nor a mystical programme. It is a model of recurrent transitions through which forms at different levels—biological, geological, cosmic, architectural and symbolic—may be analysed. Its purpose is not to replace the individual sciences, but to provide a common language for comparing their morphological results.

This understanding will make it possible to consider the Matrix as a meta-theoretical language. If code describes the internal sequence of form generation, language enables that sequence to be applied to material from different disciplines. Biology, geology, cosmology, architecture and symbolic systems employ different scientific and cultural languages. The concept of the Matrix may become an instrument of translation between them, provided it maintains rigorous criteria, distinguishes levels of evidential support and does not transform analogies into unsupported claims.

5.3. The Matrix as a Meta-Theoretical Language

Having considered the Matrix as a morphogenetic code, it is necessary to turn to another important aspect of the hypothesis: the understanding of the Matrix as a meta-theoretical language. If code describes the internal logic of the unfolding of form, language makes it possible to apply this logic to different fields of knowledge. Biology, geology, cosmology, architecture, archaeology, art history and symbolic systems use different concepts, methods and types of evidence. All of them, however, encounter the problem of form in one way or another. The Matrix may be regarded as a language that allows these different materials to be compared without conflating them or substituting one discipline for another.

The concept of a meta-theoretical language means that the Matrix is not simply another particular theory within biology, geology or cosmology. It does not describe only a leaf, stone, nebula or ancient symbol. Its task is different: to create a general level of description at which forms of different kinds may be compared according to structural features. Such a language does not negate the specialised sciences. It operates across them as a level of morphological comparison. A particular science explains the mechanism through Ih an object arose, while the meta-theoretical language identifies recurrent principles of its organisation.

This distinction is fundamental. Biology must explain how tissues, organs, vascular networks, leaves, flowers and embryonic structures form. Geology must explain the origins of landforms, folds, faults, river networks, coastlines, minerals and stone textures. Cosmology and astrophysics must explain the development of nebulae, galaxies, stellar clouds and large-scale structures of matter. Architecture must analyse the spatial organisation of buildings, axes, centres, tiers, domes, portals and proportions. Cultural studies and art history must examine symbols, ornaments, artefacts, and representations of the tree, circle, star, mandala and sacred geometry within their historical contexts. The Matrix does not replace these explanations, but creates a shared language through which one may ask which structural invariants recur across all these fields.

The Matrix as a meta-theoretical language must be, above all, a language of form. Form here is understood not as superficial appearance, but as a mode of organisation. The analysis therefore centres not on impressions, but on features: centre, axis, symmetry, symmetry breaking, layering, branching, radiality, spirality, self-similarity, an active edge, staged development, the transition from a potential state to an unfolded structure, and the relationship between part and whole. These features may become the ‘vocabulary’ of the language of the Matrix.

If the linguistic analogy is maintained, each morphological invariant may be regarded as an individual word or sign. Centre, axis, layer, branch, edge, spiral, radius, network and cycle are fundamental elements of description. Language, however, does not arise from separate words, but from relationships among them. The Matrix as a language must therefore describe not only the presence of features, but also their connections: the centre generates an axis; the axis establishes direction; layers record stages; branching unfolds multiplicity; the periphery forms an active edge; fractality connects part and whole; and reproduction returns form to a new beginning. Only a system of such relationships transforms a list of features into a language.

The meta-theoretical language of the Matrix is especially important because different sciences frequently use different terms to describe structurally similar phenomena. A biologist speaks of leaf venation, vascular networks or morphogenetic fields. A geologist speaks of faults, channels, folds, layers and erosional forms. An astrophysicist speaks of gas-and-dust clouds, shells, galactic arms, density waves and filamentary structures. An art historian speaks of a compositional centre, axis, symmetry, ornamental rhythm and tiered organisation. These languages differ, but the same structural relationships may recur within them. The Matrix offers a means of translation among them at the morphological level.

Such translation must not be arbitrary. A leaf vein, river tributary, crack in a stone and galactic arm cannot simply be declared the same thing. They are different objects arising from different causes. It may, however, be said that all can be considered as forms of directed distribution from a larger structure towards the periphery, or from a centre towards multiple lines. A shared concept—branching or ramified structure—then emerges. It does not erase differences, but permits comparison among different realisations of a single morphological principle.

It is precisely here that the strength of a meta-theoretical language lies. It does not replace specificity with abstraction, but creates a level at which specific forms become comparable. A leaf remains a leaf, a river remains a river, a crack remains a crack, a nebula remains a nebula and an ornament remains a cultural form. All may nevertheless be described through particular structural features. This approach avoids both crude reductionism and the chaotic accumulation of analogies.

The Matrix as a language must be founded upon a distinction among levels. The first is the natural-scientific level. It encompasses actual processes of self-organisation and form generation in living and non-living nature: biological morphogenesis, reaction–diffusion processes, mechanochemical and bioelectric models, geological deformation, hydrological networks and the cosmic structuring of matter. At this level, a rigorous connection with the relevant scientific disciplines is required. The second is the comparative and morphological level, at which forms are analysed according to features independently of their specific mechanisms. The third is the philosophical and hermeneutic level, at which symbols, mythological images, artefacts, sacred geometry and cultural models of form are considered.

If these levels are conflated, the hypothesis loses rigour. An ancient symbol of the World Tree, for example, cannot be used as evidence that river networks and vascular systems share a single physical cause. It may, however, be used as evidence of the cultural recording of the structure ‘centre–axis–levels–branches–fruit’. A nebula cannot be called a flower in the biological sense, but its radiality, layering, centre and active edge may be analysed. A stone cannot be understood as a living body, but its texture may be considered as a result of layering, stress and the recurrent organisation of matter. The meta-theoretical language of the Matrix must constantly preserve these distinctions.

In this sense, the Matrix is a language of disciplined analogies. Analogy is not in itself a weak method when used correctly. Many scientific ideas developed through the transfer of models from one field to another. An analogy becomes productive, however, only when the basis of comparison and the limits of transfer are stated clearly. Within the hypothesis of the Matrix, comparison is based not upon emotional impressions, but upon structural features. Its limits are determined by differences in mechanisms, materials, scales and levels of evidential support.

A flower and a nebula, for example, may be compared only according to features that have actually been identified: centred organisation, radial unfolding, layering, a peripheral shell, a complex edge. Such comparison does not mean that a nebula is alive, that it flowers or that its form is created through a biological mechanism. A river network and vascular system may be compared according to the principles of branching and flow distribution, but this does not mean that a river possesses an organism or blood vessels. An architectural axis and a plant stem may be compared as forms of direction and spatial organisation, but they belong to different ontological levels. It is precisely such qualifications that make the language of the Matrix scientifically and philosophically acceptable.

The Matrix as a meta-theoretical language may also be useful in working with images. Modern science and culture produce enormous quantities of visual data: microscopic images of tissues, botanical photographs, terrain maps, satellite imagery, geological sections, astrophotographs, digital reconstructions, archaeological photographs, images of artefacts and diagrams of sacred geometry. These materials are often considered separately within their respective disciplines. The language of the Matrix makes it possible to arrange them into comparative series, provided The same features are recorded for every image.

This approach is especially important to the future BIO–GEO–COS comparative sets. A biological image may show a leaf, flower, vascular network or coral. A geological image may show a river network, stone texture, fold, fault or coastline. A cosmic image may show a nebula, spiral galaxy, gas cloud or filamentary structure. At the ordinary level, these are different images. At the level of the language of the Matrix, they may be described using a common table of features: centre, axis, layers, branching, periphery, edge, fractality, radiality, spirality and stage of unfolding. This transforms visual comparison into a method.

It is important that such a method be reproducible. A researcher must not merely state: 'These forms appear similar to me.' The researcher must indicate which features have been identified and how they have been classified. Is a centre present? If so, what kind of centre is it: geometrical, functional, energetic, compositional, gravitational or developmental? Is an axis present? Is it vertical, radial, curved, rotational, fault-related or symbolic? Are layers present? Are they biological, geological, optical or compositional? Is branching present? Does it distribute flow, stress, signals, matter or meaning? Such detail makes the language of the Matrix analytical.

The meta-theoretical language must also include negative answers. If an object possesses no clearly expressed centre, this must be recorded. If self-similarity is absent, it cannot be declared concealed without evidence. If a form resembles another object only visually but lacks corresponding structural features, it must not be used as a strong argument. If a cultural symbol possesses a similar composition but a different historical meaning, this difference must be stated. The capacity of the hypothesis to record not only correspondences, but also divergences, is an important condition of its scientific maturity.

The Matrix as a language for comparing biology and geology makes it possible to observe that living growth and non-living form generation may produce similar structural solutions. In biology, branching is connected with growth, nutrition, respiration, signal transmission, increasing surface area and reproduction. In geology, branching is associated with channels, cracks, faults, erosion, lava flows, submarine canyons and the distribution of stresses. The mechanisms differ, but the language of form permits them to be described through the concepts of hierarchy, direction, distribution, periphery and self-similarity.

Comparing biology and cosmology requires still greater caution, but is also possible at the morphological level. A biological flower and cosmic nebula do not share a biological mechanism. Both forms may nevertheless display centred organisation, radiality, layering, shell-like organisation, a complex edge and a transition from internal concentration to external unfolding. If these features are recorded clearly, they may be included in comparative analysis. The conclusion must, however, remain structural: what is involved is similarity of morphological organisation, not identity of nature.

Comparison between geology and the cosmos opens another level. Mountain structures, faults, cloud-like landforms, volcanic flows and coastlines may be compared with cosmic shells, filaments, spiral arms and gas-and-dust structures according to features of the edge, layering, rupture, filamentary organisation and the distribution of matter. Scale and the physics of the processes must, however, be considered especially rigorously. A geological crack and cosmic filament are not one process. Both may nevertheless be regarded as lines of structural heterogeneity manifesting the distribution of forces or matter.

Architecture occupies a special position within the language of the Matrix. Unlike biology, geology and the cosmos, architectural form is created by human beings. It is a cultural and technical form. Architecture nevertheless works with the centre, axis, level, tier, dome, column, portal,

façade, rhythm, proportion, symmetry, symmetry breaking, and internal and external space. Architecture may therefore be included in the meta-theoretical language of the Matrix as a domain in which form is modelled consciously. In architecture, human beings do not merely build shelter; they organise space according to stable morphological principles.

Architectural forms associated with the axis and centre are especially important: temples, domed structures, towers, pyramids, stepped structures, urban squares, radial plans, sacred centres, portals and colonnades. They may be understood as cultural transformations of natural morphological principles. At the symbolic level, the verticality of architecture may be compared with the axis of a tree or mountain. A dome may be regarded as a shell-like form. Radial planning may be understood as organisation spreading from a centre. Tiering may be understood as cultural layering. These comparisons, however, belong to the level of symbolic and spatial organisation, not natural morphogenesis.

Symbolic systems constitute still more subtle material. The World Tree, mandala, Shri Yantra, circle, star, lotus, spiral, ornament, bas-relief, sacred geometry and cosmological diagrams of different cultures may display features of the Matrix: a centre, axis, layers, radiality, branching, cyclicality, self-similarity and connection among levels. These forms, however, are produced not by natural forces, but by human consciousness, tradition, ritual, technique and cultural memory. The language of the Matrix must therefore treat them as hermeneutic material: they help us understand how human beings conceptualised and symbolically consolidated universal structures of form.

In this respect, the Matrix as a meta-theoretical language connects scientific and humanistic approaches. The natural sciences provide data about the form generation of matter. The humanities provide data about how form becomes a symbol, image, architecture, ritual scheme or cultural model of the world. The hypothesis of the Matrix must not dissolve one into the other. It must demonstrate that a common subject exists—form as organisation—but that this form possesses different levels of existence: natural, physical, biological, geological, cosmic, technical and symbolic.

This approach makes it possible to avoid an artificial rupture between nature and culture. Culture is not a direct continuation of biology or geology, but it arises within a world of forms and creates forms of its own. Human consciousness perceives trees, stars, stones, mountains, flowers, rivers, circles, spirals and symmetries and transforms them into symbols. Cultural forms may therefore be regarded as secondary, meaningful and semiotic reworkings of natural morphology. The Matrix as a language makes it possible to describe this transition from natural form to cultural image.

Boundaries must once again be preserved. If an ancient bas-relief possesses a form resembling a tree, flower, winged structure or centred composition, this does not mean that its creators possessed modern theories of fractality or morphogenesis. Modern scientific concepts must not be ascribed to ancient cultures. It may, however, be stated that such cultures could record stable structures of the world intuitively, symbolically and visually. This is an important distinction. The Matrix must not transform the history of culture into a collection of confirmations of a predetermined scheme. It must respect historical context.

The meta-theoretical language of the Matrix also requires terminological discipline. Expressions such as ‘identity’, ‘similarity’, ‘analogy’, ‘morphological correspondence’, ‘structural invariant’, ‘symbolic parallel’ and ‘visual association’ must be distinguished. These terms carry different weights. Identity denotes complete correspondence and should almost never be used within the

hypothesis for objects of different kinds. Similarity may be external and weak. Analogy indicates comparison according to a particular feature. Morphological correspondence requires a more rigorous match between structural elements. An invariant denotes a recurrent principle of organisation. A symbolic parallel belongs to the cultural level. Visual association is the weakest level.

Without such a terminological scale, the hypothesis may become excessively loose. If every resemblance is called an invariant, the concept of the invariant will lose its force. If every symbolic form is called evidence for the Matrix, scientific logic will be violated. If every complex form is called fractal, the concept of fractality will become decorative. The meta-theoretical language of the Matrix must therefore not only connect fields of knowledge, but also rank the degree to which comparisons are substantiated.

Several levels of analysis may be proposed. The first is visual and morphological observation: an object possesses features reminiscent of other forms. The second is structural description: features are recorded in terms of centre, axis, layer, branching, edge and self-similarity. The third is comparative classification: the object is incorporated into a group of analogous forms. The fourth is quantitative verification: parameters such as fractal dimension, edge curvature, degree of radiality and branching index are measured. The fifth is theoretical explanation: the comparison is connected with known mechanisms of self-organisation or morphogenesis. Only at the higher levels is it possible to speak of strong support for the hypothesis.

This approach is especially important when working with images of artefacts and cultural objects. A Sumerian bas-relief, for example, may be considered as a bearer of a centred or axial composition, but this does not mean that it constitutes a natural fractal system. It must be analysed as a cultural object: who created it, in what context, which symbols were used, how the composition is organised, which elements recur and which meanings may have been associated with the image. Only after this can its place within the language of the Matrix as a symbolic or hermeneutic form be discussed cautiously.

Architectural forms also require a distinct level of analysis. A building or temple does not arise through the self-organisation of matter in the same sense as a crystal or tree. It is designed and constructed in accordance with technical, social, religious and aesthetic requirements. Architecture may nevertheless consciously employ morphological principles resembling natural ones: axis, centre, symmetry, tiering, radiality, modularity and fractal ornament. Architecture is therefore a domain in which the Matrix is manifested not as a natural process, but as the cultural and technical reproduction of structural principles of form.

The meta-theoretical language of the Matrix may be especially useful in interdisciplinary research. It allows a botanist, geologist, astrophysicist, architect, art historian and philosopher to speak about a common subject—form—without losing the specificity of their disciplines. The botanist may explain leaf venation, the geologist a river network, the astrophysicist a spiral galaxy, the architect a radial plan and the art historian an ornamental composition. The philosophical task is to identify how these descriptions may be connected through shared morphological categories.

Such an interdisciplinary language is always at risk of superficiality. The broader the scope, the greater the risk of generalising too quickly. The Matrix as a meta-theoretical language must therefore be constructed not through expansion at any cost, but through precision. It is better to acknowledge a limited field of applicability than to proclaim universality without evidence. The

hypothesis must develop through the successive accumulation of verified correspondences rather than through the free play of images.

In this sense, the language of the Matrix must remain open. It should not establish a definitive set of features in advance. New invariants may emerge during analysis: filamentary organisation, porosity, modularity, rhythm, shell-like organisation, nodal structure, gradient organisation or network distribution. Some features may prove less universal than initially assumed. Different kinds of objects may require different sublanguages: biological, geological, cosmic, architectural and symbolic. Such openness does not weaken the hypothesis, but makes it genuinely investigative.

The Matrix as a language may also be represented as a system of descriptive coordinates. Any object, for example, may be located along several analytical axes: degree of centred organisation, expression of an axis, degree of layering, character of branching, type of periphery, edge complexity, presence of self-similarity, degree of radiality, degree of spirality, stage of morphogenetic unfolding, level of evidential support and type of system. Such a coordinate system would make it possible not only to describe individual forms, but also to compare them.

This could subsequently lead to the creation of a morphological database. Each object—a leaf, flower, stone, landform, nebula, galaxy, bas-relief or architectural form—would be described according to a common scheme. It would then become possible to analyse which features occur together most frequently, which groups of forms constitute stable types, which correspondences prove strong, which weak and which require further verification. In this case, the Matrix becomes not only a philosophical concept, but also a methodology of classification.

The connection between the language of the Matrix and visual thought is particularly significant. Many forms are first perceived visually and only subsequently become objects of analysis. Visual recognition plays an important heuristic role: it allows a potential similarity to be noticed. Rigorous description must then follow. Visual thought poses the question, while the meta-theoretical language provides the procedure. In this way, an aesthetic impression is transformed into a research hypothesis.

This is especially important to the very nature of the hypothesis under consideration. The hypothesis of the Unified Matrix of the Universe arose from the observation that forms recur in different fields. Such an origin is not a defect. Many scientific and philosophical ideas begin with observation. The subsequent fate of a hypothesis, however, depends on whether it can move from observation to concept, from concept to method and from method to verification. The Matrix as a meta-theoretical language constitutes precisely this transition.

In scientific and philosophical terms, the language of the Matrix performs three functions:

1. Descriptive: it makes it possible to name and record features of form.
2. Comparative: it makes it possible to compare forms from different fields.
3. Heuristic: it makes it possible to pose new questions. Why do similar structures arise in different systems? Which mechanisms may lead to such forms? Where does the boundary lie between coincidental resemblance and a stable invariant? Can these features be measured? Can models of their emergence be constructed?

The heuristic function is particularly important. The Matrix must not serve only as a means of describing already known facts. It should help to identify new directions of research. If similar types of branching are found in biology and geology, for example, general mathematical models

of flow distribution may be investigated. If radial structures are identified in floral and cosmic forms, general principles of centre–periphery organisation may be studied. If layering is found in stone textures and botanical forms, the roles of staged development and process memory may be compared. Such questions do not prove the hypothesis immediately, but they make it productive.

The meta-theoretical language of the Matrix may also contribute to a new classification of forms. Classical classifications are usually based on the category to which an object belongs: biological, geological, cosmic or cultural. The language of the Matrix makes it possible to classify forms additionally according to their type of organisation: centred, axial, radial, spiral, branching, networked, layered, fractal-like, shell-like, modular and cyclical. Such a classification does not replace object-based classification, but supplements it. It demonstrates that different objects may belong to the same morphological type while remaining different in nature.

This is especially important to the understanding of universality. The universality of the Matrix does not mean that one form is repeated everywhere. It means that a limited set of morphological principles may be combined repeatedly within different systems. The meta-theoretical language makes it possible to describe these combinations. A flower, for example, may be centred, radial, layered and modular. A river network may be branching, fractal-like, hierarchical and distributed towards the periphery. A nebula may be centred, shell-like, filamentary and layered. The World Tree may be axial, branching, tiered and symbolically cyclical. Precise comparison thereby becomes possible without crude identification.

The Matrix as a language also requires natural and artificial forms to be distinguished. Natural form arises through physical, biological, geological or cosmic processes. Artificial form is created by human beings. Human beings, however, are themselves part of nature and employ natural principles in thought, technology and symbolism. Artificial forms may therefore reproduce natural invariants consciously or unconsciously. Architecture, ornament, sacred images, schemes of the world and even modern graphic models may be considered cultural realisations of a morphological language.

The reverse error must also be avoided: natural forms cannot be explained through cultural symbols. The fact that a nebula resembles a mandala does not mean that the cosmos is organised according to a cultural scheme. The fact that the tree became a symbol of the world does not mean that all of nature is literally a tree. Cultural forms assist interpretation, but do not explain natural mechanisms. The Matrix as a meta-theoretical language must preserve the direction of analysis: natural forms are studied scientifically, cultural forms historically and hermeneutically, and comparison is conducted at the level of morphological features.

An important task of the language of the Matrix Is to provide conceptual protection against mystification. The word ‘Matrix’ itself may evoke ideas of a hidden programme, secret code, sacred scheme or supernatural organisation of the world. It must therefore be clarified continually that in this book the Matrix is a hypothetical model of the structural organisation of form. It is not a mystical object. It is not proved by the resemblance between two attractive images. It does not negate scientific mechanisms. It functions as a language of description, comparison and inquiry.

It is Precisely this understanding that makes the hypothesis potentially productive in scientific terms. If the Matrix were declared a hidden entity, it could not be tested. If it is understood as a language of morphological invariants, however, it can be developed, refined and criticised. It is possible to test how well this language describes different forms, determine which features

genuinely recur, identify exceptions, construct classifications and translate visual series into parameters. Such testability is an important condition for the further development of the hypothesis.

The meta-theoretical language of the Matrix is also connected with educational and explanatory functions. It makes it possible to demonstrate to the reader that forms in nature and culture are not a collection of random impressions. Recurrent modes of organisation may be identified within them. Such a language makes complex interdisciplinary connections accessible without oversimplifying them. It helps to explain why a leaf, river network, nebula and World Tree may be placed alongside one another in the same book—not as identical things, but as different bearers of structural principles.

It is especially significant that the language of the Matrix connects the visible and the invisible. Visible form is frequently the manifestation of concealed processes: growth, pressure, stress, fields, flows, gravity or symbolic meaning. A meta-theoretical language makes it possible to read visible form as a trace of these processes. A leaf reveals the invisible dynamics of growth and distribution. A stone reveals the concealed history of pressure and crystallisation. A nebula reveals the distribution of matter and energy. Architectural form reveals a cultural conception of space. A symbol reveals a structure of world perception. In every case, form becomes available as a text of process.

This does not mean that form is literally a text in the humanistic sense. Philosophically, however, it may be ‘read’ if rules of reading exist. The Matrix proposes such rules: identify the centre, axis, layers, branching, edge, self-similarity, stage of unfolding and relationship between part and whole. Such reading does not replace measurement, but directs attention. It helps us to perceive not only a contour, but organisation.

The language of the Matrix must subsequently be applied to specific materials. Biological forms will demonstrate a living realisation of the code. Geological forms will demonstrate a dense realisation operating over deep time. Cosmic forms will demonstrate a large-scale and rarefied realisation. Artefacts and symbols will demonstrate a cultural and hermeneutic realisation. Architecture will demonstrate a spatial and technical realisation. Each of these areas will require its own qualifications, but the common language will allow them to be retained within a single hypothesis.

The Matrix as a meta-theoretical language is therefore a system of concepts that makes it possible to compare forms from different fields of knowledge through recurrent morphogenetic invariants. It is not a substitute for the individual sciences, a mystical code or a form of visual resemblance. Its task is to create a disciplined language of interdisciplinary analysis through which biological, geological, cosmic, architectural and symbolic forms can be described according to common features without losing their specificity.

In this capacity, the Matrix becomes not only the content of the hypothesis, but also its method. It determines which features to seek, how objects should be compared, how levels of evidential support should be distinguished, how mechanism should be separated from morphology, and how natural-scientific and humanistic material should be connected. If the hypothesis of the Unified Matrix of the Universe is to be taken seriously, this meta-theoretical language must become its principal instrument. Through it, the discussion can proceed to the next problem—the problem of universality: why similar forms arise in systems of different kinds and whether this can be explained through common principles of self-organisation.

5.4. The Matrix and the Problem of Universality

The problem of universality is central to the hypothesis of the Unified Matrix of the Universe. If the Matrix is understood only as a convenient metaphor for describing individual similar forms, it remains within the limits of figurative comparison. If it aspires to the status of a scientific and philosophical hypothesis, however, it is necessary to explain why similar structural principles may arise in systems of different kinds: living organisms, geological bodies, cosmic formations, architectural forms and symbolic systems. This question defines the scope of the entire concept.

Universality in this case does not mean absolute sameness. This is fundamentally important. The hypothesis does not claim that all forms in the Universe are constructed according to the same blueprint or that every object is a variant of one geometrical figure. Such a position would be excessively reductive and methodologically weak. The real world displays immense diversity: a leaf is not a stone, a stone is not a nebula, a nebula is not a temple, a temple is not an embryo, and an embryo is not an ancient bas-relief. Every object possesses its own nature, material, mechanism of origin and context.

The universality of the Matrix must therefore be understood differently: as the possible recurrence of principles governing the structural organisation of form despite differences in mechanisms, materials and scales. In other words, it may be the mode of form generation—not an object, substance or particular form—that is universal. Centred organisation, axiality, layering, branching, radiality, spirality, an active edge, self-similarity, the transition from potentiality to manifestation and cyclical reproduction may be manifested in different systems without reducing those systems to the same thing.

The principal question of this chapter may be formulated as follows: why do similar forms arise in systems of different kinds? At first sight, this question may appear excessively broad. Yet this is precisely the question posed by comparative morphology. Why may a tree, vascular network, river basin and system of cracks all possess a branching character? Why are a flower, mandala, crater, nebula and certain architectural plans organised around a centre? Why does the spiral occur in plants, vortices, shells, galaxies and ornaments? Why is layering present in buds, tissues, stones, landscapes, nebulae and cultural compositions? These questions do not automatically prove the hypothesis, but they require a common explanatory language.

The answer offered by the hypothesis of the Unified Matrix of the Universe is that systems of different kinds may be governed by common principles of self-organisation. This does not mean that the same physical mechanism operates everywhere. Rather, different systems encounter similar structural tasks: distributing a flow, maintaining a form, connecting centre and periphery, passing from homogeneity to difference, organising growth or movement, stabilising a boundary, repeating structure at different scales and preserving a trace of process within form. Similar morphological solutions may emerge as these tasks are addressed.

Branching may arise in biology because a living organism needs to distribute substances, water, air, signals or directions of growth. In geology, it may arise because water seeks drainage paths, a crack propagates stress or a lava flow divides according to relief. In an electrical discharge, branching is associated with the propagation of the discharge through a medium. In culture, branching becomes a symbol of origin, kinship, growth, connections among worlds and the propagation of meaning. The mechanisms differ, but the structural principle is similar: a single direction passes into a multiple system of distribution.

The same may be said of radiality. In biology, the radiality of a flower is connected with growth around a centre and reproductive function. In geology, a radial structure may arise around a crater, volcanic centre, dome or point of ejection. In the cosmos, radiality may be associated with the expansion of matter, radiation, shock waves or the shell of a nebula. In architecture, radiality may result from a compositional conception organising space around a centre. In symbolism, it expresses the ideas of wholeness, sacred centrality and the propagation of force or meaning. What is universal here is not the cause, but the relationship 'centre–periphery'.

Spirality likewise demonstrates how one morphological principle may arise in different media. In plants, a spiral may be associated with growth and the arrangement of elements. In vortices, with the movement of liquid or gas. In galaxies, with rotation, density waves and gravitational dynamics. In ornaments, with the cultural recording of movement, development, cyclicality and return. The spiral is universal not because all these forms possess one source, but because the combination of centre, rotation, repetition and displacement may constitute a structurally stable solution in different systems.

Layering reveals another aspect of universality. In biology, layers may be tissues, envelopes, petals or embryonic structures. In geology, layers record accumulation, pressure, sediment formation, and volcanic or metamorphic processes. In the cosmos, shells and zones of different density may record stages of expansion, ejection or the interaction of matter. In culture, nested circles, tiers and levels of a mandala or World Tree express sequence, depth and transition between regions. Layering is universal not as identical material, but as a principle that records stages and boundaries between states.

The Matrix as a hypothesis must therefore operate not at the level of individual images, but at the level of relationships. What is universal are relationships: centre and periphery, axis and branches, one layer and the next, part and whole, internal and external, potential and manifested, order and variation, symmetry and its breaking. These relationships may be realised in different substrates: tissue and cells in biology; rock, water, pressure and relief in geology; gas, dust, gravity and radiation in the cosmos; and sign, composition, material and symbolic thought in culture.

This understanding of universality makes it possible to avoid reductionism. Reductionism would arise if the hypothesis attempted to reduce every form to a single mechanism. It would be erroneous, for example, to claim that a river network, vascular system and neural network arise from the same cause. They do not. It would, however, be equally erroneous to prohibit comparison completely merely because their mechanisms differ. Between identity and complete incomparability lies a domain of morphological analogy. It is within this domain that the concept of the Matrix operates.

The problem of universality is also connected with constraints. Different systems may arrive at similar forms because they encounter a limited set of physical, spatial and functional conditions. Matter cannot organise itself arbitrarily. A flow must move along a gradient. Growth must occur within a resistant environment. Stress must be released somewhere. Matter must be distributed through space. A surface must possess a boundary. A centred system must connect internal and external in some way. Certain forms therefore prove stable not because they were predetermined, but because they are effective solutions to recurrent organisational problems.

In this sense, the Matrix may be understood as a set of stable morphological solutions arising under conditions of self-organisation. Where a centre and propagation are present, radiality may arise. Where there are flows and distribution, branching may arise. Where rotation and a gradient

are present, a spiral may arise. Where accumulation or expansion occurs in stages, layering may arise. Where a local rule is repeated at different scales, fractality may arise. Where form interacts with its environment, an active edge appears. These solutions are not mystical; they may result from general conditions of form generation.

Universality must not, however, be declared in advance. It must be tested. The hypothesis may propose that particular invariants recur in different fields, but must then demonstrate where they recur, how consistently, in which combinations, at which scales and under which limitations. The universality of the Matrix cannot be established through one example or even several striking illustrations. It must be constructed through systematic comparison.

This requires a classification of features. If a centre is discussed, types of centre must be distinguished: geometrical, functional, energetic, gravitational, developmental, compositional and symbolic. If an axis is discussed, the axis of growth, symmetry, rotation, deformation or composition and the symbolic vertical must be distinguished. If layering is discussed, biological layers, geological strata, cosmic shells, architectural tiers and cultural levels must be distinguished. If branching is discussed, biological, hydrological, fracture-related, electrical, filamentary and symbolic branching must be distinguished. Such classification permits universality to be discussed precisely rather than rhetorically.

The problem of universality also requires the strength of correspondence to be differentiated. Some objects may display the complete set of features of the Matrix: a centre, axis, layers, branching, periphery, self-similarity and a cycle. Others may display only two or three. Still others may possess merely an external resemblance without a profound structural connection. Gradations must therefore be introduced: strong morphological correspondence, partial correspondence, weak analogy, visual association and absence of significant correspondence. Such a scale protects the hypothesis from excessive generalisation.

A flower, for example, may be a strong object of analysis because its centre, radiality, layering, unfolding, periphery, modularity and connection with the cycle of the seed are clearly expressed. A leaf is likewise a strong object because it possesses an axis, venation, network, edge, self-similarity and functional distribution. A river network may be strong in terms of branching and fractality, but weaker in terms of a centre or cyclical reproduction. A nebula may possess a clearly expressed centre, shell-like organisation and active edge, but its self-similarity requires separate verification. A cultural symbol may clearly display a centre and axis, but its evidential level will be hermeneutic rather than scientific.

Such gradation is especially important when working with cultural material. Artefacts, bas-reliefs, sacred geometry, crop circles, representations of the World Tree and ancient symbols may be highly expressive. Their universality, however, belongs to a different level. They demonstrate that human beings created forms structurally related to natural invariants. This does not establish that natural processes themselves have cultural origins or that ancient images are scientific diagrams in the modern sense. They may serve as evidence of the symbolic assimilation of form, but cannot replace the analysis of biological, geological and cosmic processes.

The question of universality is also connected with the history of scientific thought. Science has repeatedly discovered that different phenomena may be described through common principles. Waves occur in water, sound, light and quantum systems, but this does not mean that all waves possess the same nature. Networks occur in biology, society, technology, ecology and information, but every network has its own substrate. Non-linear processes occur in chemistry,

physics, biology, economics and climate, but the mechanisms differ. Similarly, the Matrix may be understood as an attempt to identify a common morphological level without erasing the specificity of particular systems.

This makes the hypothesis not an exception to scientific tradition, but part of a broader interdisciplinary movement. Contemporary research on complex systems demonstrates that different fields may possess similar types of organisation: self-organisation, non-linearity, feedback, fractality, network structure, critical transitions and pattern formation. The hypothesis of the Matrix occupies the same field, but places emphasis upon form as the visible and structural result of such processes.

The Matrix and the problem of universality are also connected with scale. One of the strongest aspects of the hypothesis is its attempt to compare micro-, meso- and macro-levels of form. In biology, these may include the cell, tissue, organ, plant, organism and network. In geology, the mineral, stone texture, crack, stratum, landform, river system and mountain range. In the cosmos, a cloud of gas, nebula, stellar region, galaxy and cluster. In culture, a sign, ornament, artefact, architectural structure and cosmological scheme. The universality of the Matrix is tested precisely through the capacity of features to retain their significance during transitions between scales.

Fractality plays a central role in this transition. If a part reproduces the principle of the whole, form may be compared not only horizontally among different objects, but also vertically among different levels of one system. A tree branch repeats the principle of the tree. A leaf vein repeats the principle of plant branching. A tributary repeats the principle of the river. A small crack repeats the character of a major fault. A filament within a cloud may repeat the general heterogeneity of the gaseous structure. Such recurrence across scales makes the concept of universality more concrete.

Fractality also possesses limits. Not every form is self-similar. Not every self-similarity is infinite. Not every recurrence across scales possesses the same strength. The universality of the Matrix must therefore not be reduced to fractality alone. Fractality is one invariant, but not the only one. Radiality may be more important in some forms, layering in others, the axis in a third group, the active edge in a fourth, and cyclicality in a fifth. The universality of the hypothesis lies not in one feature, but in a system of features and their combinations.

In this respect, the Matrix may be understood as a morphological field of possibilities. Different systems actualise different elements within this field. A biological flower actualises the centre, radiality, layers, modularity, edge and cycle. A leaf actualises the axis, network, branching, edge and distribution. A stone actualises layering, cracks, internal memory, texture and sometimes a centre or radiality. A river actualises branching, hierarchy, flow, fractality and the edge of the channel. A nebula actualises a centre, shell, filaments, periphery and complex edge. A mandala actualises a centre, radiality, layers, symmetry and symbolic periphery. Different forms need not contain everything; they manifest different configurations of the Matrix.

This understanding makes it possible to abandon a rigid scheme and move towards a typology. The universality of the Matrix may be typological rather than absolute. Types of morphogenetic configurations may include centred-radial, axial-branching, layered-shell-like, spiral-dynamic, network-fractal, tiered-symbolic, edge-related and transitional forms. Each type may be manifested in different fields. The task of the hypothesis is therefore not to reduce everything to one form, but to describe a family of principles of form generation.

The problem of universality also requires an answer to the question of chance. Some similarities may indeed be coincidental. In a complex world containing an enormous number of forms, objects will inevitably occur that resemble one another externally. The hypothesis must not therefore deny chance. It must distinguish coincidental resemblance from stable structural correspondence. If two objects resemble one another only in general silhouette, this is a weak argument. If several independent features coincide—a centre, layers, radiality, an active edge, self-similarity and staged development—the correspondence becomes more significant.

In assessing this significance, recurrence across series must be considered. One flower and one nebula may form a striking pair, but a series containing numerous floral forms, numerous nebulae, numerous geological shells and numerous cultural radial compositions described according to identical features would be scientifically stronger. If the features recur across a series, the likelihood of coincidental analogy diminishes. The universality of the Matrix must therefore be substantiated not through isolated examples, but through systems of comparison.

The hypothesis consequently requires the creation of comparative series. A biological series may include seeds, buds, flowers, leaves, vascular networks, corals and neural structures. A geological series may include stones, folds, faults, river networks, coastlines and volcanic structures. A cosmic series may include nebulae, galaxies, stellar clouds, shells, spirals and filamentary forms. A cultural series may include artefacts, bas-reliefs, the World Tree, mandalas, sacred geometry, and architectural axes and tiers. Universality can be discussed only after such series have been analysed.

The Matrix and the problem of universality are also connected with the limits of language. Not every form can be described adequately through the Matrix. Some forms express the invariants only weakly. Some configurations are chaotic or coincidental. Some forms created through artificial destruction, technical processes or accidental superimposition possess no significant morphogenetic content. In some objects, the visual analogy is excessively strained. Acknowledging such limits does not destroy the hypothesis, but makes it more precise.

Universality must be testable, and testability requires the possibility of refutation. If every object can be declared a manifestation of the Matrix, the hypothesis becomes unfalsifiable and loses scientific force. It is therefore necessary to acknowledge in advance that an object may not correspond to the Matrix; the correspondence may be weak; the features may be coincidental; a cultural analogy may have no relationship to a natural process; or a cosmic image may have been processed in a way that creates a false impression of form. These limitations must be incorporated into the method.

The Matrix thereby becomes not a dogma of universality, but a hypothesis of possible universality. This distinction is crucial. A dogma states that universality has already been proved and is beyond doubt. A hypothesis states that universality is proposed and must be tested. The second position is the more appropriate one in the present book. The Matrix is regarded as a research model proposing to explain the recurrence of forms through common principles of self-organisation, but requiring further systematisation and testing.

The question of universality also possesses a philosophical dimension. If similar principles of form generation are genuinely manifested in different fields, this means that the world possesses not only material but also morphological unity. This need not constitute unity of substance in a metaphysical sense. It is a unity of modes of organisation. Matter may differ, processes may differ and scales may be incomparable, yet forms may display related structural transitions. It is

precisely this that makes the hypothesis of the Unified Matrix of the Universe philosophically significant.

Such morphological unity permits the relationship between nature and culture to be reconsidered. Culture does not simply create symbols arbitrarily. It frequently draws upon forms already present in natural experience: the tree, circle, star, flower, spiral, mountain, river, axis, layer and centre. Human beings perceive these forms, experience them, repeat them, generalise them and transform them into signs and architectural schemes. The universality of the Matrix may therefore be manifested not only in nature, but also in the human way of understanding nature. Culture becomes not evidence of a physical law, but evidence that morphological invariants possess a capacity to generate meaning.

In this sense, the Matrix connects the ontological and hermeneutic levels. The ontological level concerns how forms arise in nature. The hermeneutic level concerns how these forms are understood, symbolised and reproduced by human beings. Biology, geology and the cosmos belong primarily to the first level. Artefacts, bas-reliefs, the World Tree, sacred geometry and architecture belong to the second. The language of the Matrix, however, makes it possible to perceive a connection between them: cultural form may constitute a meaningful reflection or reworking of natural structural principles.

Hermeneutics must not, however, be transformed into evidence of ontology. The fact that human beings represented the World Tree does not prove the physical existence of a cosmic tree. The fact that a mandala possesses a centre and radiality does not prove that all natural forms are constructed like a mandala. It does demonstrate that the centre, radiality, axis, levels and cycles are stable structures of human meaning-making. This is important within the hypothesis of the Matrix because it seeks not only to describe nature, but also to explain why particular forms become universal symbols.

The problem of universality also concerns the evolution of form. In different systems, form may develop, become more complex, disintegrate, recur and pass into new states. In biology, this occurs through the evolution of organisms and development of individual forms. In geology, through changes in landforms, rocks, layers and faults. In the cosmos, through the evolution of stellar and galactic structures. In culture, through transformations of symbols, architectural schemes and artistic motifs. If the Matrix describes only static features, it will remain incomplete. Universality must include the dynamics of changing form.

This is why the concept of the Matrix is closely connected with morphogenesis. It is not only form that may be universal, but also the process of its becoming. A centre arises, an axis becomes differentiated, layers form, branching propagates, the edge becomes more complex, the structure stabilises and a new cycle may then begin. This processual logic may be expressed differently in different systems, but the sequence of transitions itself is the subject of the hypothesis. The Matrix is the universality not of finished figures, but of morphogenetic transitions.

The A–B–C–D model helps to make this approach more concrete. Stage A corresponds to a potential state, stage B to the beginning of difference and direction, stage C to differentiation and increasing complexity, and stage D to a manifested structure. If this scheme demonstrates explanatory power in biology, geology, the cosmos and culture, it may become one of the foundations for the universality of the hypothesis. It must, however, be applied cautiously. In some objects, the stages are expressed clearly; in others, only partially; and in still others, only metaphorically. The degree of applicability must be an object of analysis, not a presupposition.

The universality of the Matrix may also be connected with the principle of economy in form generation. Nature need not invent an infinite number of principles of organisation. A limited number of structural solutions may be combined repeatedly to generate enormous diversity. The centre, axis, layer, branching, spiral, radiality, fractality, edge and cycle may be combined in different proportions to create numerous forms. This resembles language, in which a limited number of letters and rules can generate an infinite number of texts. In this sense, the Matrix is a grammar of form.

A grammar does not, however, create a text by Itself. Material, process, conditions, energy and history are required. Similarly, the Matrix does not create a particular form without an environment. A leaf forms within a plant, a stone within a geological process, a nebula within a cosmic environment and a temple within a cultural and technical practice. A universal grammar of form is realised only through specific conditions. The universality of the Matrix is therefore always embodied rather than abstract. It does not exist separately from the world, but is manifested through numerous processes within it.

This understanding avoids opposition between the universal and the individual. An individual form does not negate universality, but manifests it concretely. Every leaf is unique, but leaf organisation preserves a general type. Every river is unique, but a river network conforms to particular principles of drainage and branching. Every nebula is unique, but certain structural features recur. Every symbol possesses cultural specificity, but its centre, axis and levels may be recognisable. Universality does not eliminate individuality; it makes individuality structurally intelligible.

An important consequence is the rejection of the search for an ideal form. If the Matrix is manifested in reality, it is manifested through deviations, asymmetries, damage, irregularities, chance events and historical traces. Real forms are not pure geometrical schemes. The hypothesis must therefore work with natural complexity rather than ideal drawings. Fractality, non-linearity and self-organisation demonstrate that the order of nature is frequently irregular, variable and open. The universality of the Matrix must be the universality of living order, not of a lifeless scheme.

The problem of universality also establishes the direction of the subsequent study. Having defined the Matrix as a principle, code, language and model of universality, it is necessary to proceed to a more specific formulation of its structure. Which elements constitute the Matrix? How are the circle-seed, axis, leaf-like unfolding, layers, active edge and fractal repetition related? How does the A–B–C–D staged scheme operate? Which levels of evidential support can be distinguished? How should images and artefacts be analysed? These questions will form the subject of the following chapters.

The Matrix and the problem of universality are therefore inseparable. Without a claim to universality, the Matrix remains a local metaphor. If universality is understood crudely, the Matrix becomes a dogmatic scheme. The scientifically and philosophically productive path is to understand universality as the recurrence of morphogenetic principles in different systems while preserving distinctions among mechanisms, materials, scales and levels of evidential support. It is this approach that allows the hypothesis of the Unified Matrix of the Universe to retain both breadth and methodological caution.

The principal conclusion of the chapter may therefore be formulated as follows: within the present hypothesis, the Matrix is neither an object nor a mystical entity, but a hypothetical universal principle of the structural organisation of form; as a morphogenetic code, it describes

the sequence through which form unfolds from centre to periphery and reproduction; as a meta-theoretical language, it permits comparison among data from biology, geology, cosmology, architecture and symbolic systems; and as a problem of universality, it requires an explanation of why similar forms arise in systems of different kinds. The answer offered by the hypothesis is that such systems may be governed by common principles of self-organisation manifested through recurrent morphological invariants.

This concludes the chapter on the concept of the Matrix. It has established the conceptual framework for the second part of the study. The next step is to proceed from the general definition to the internal structure of the hypothesis: the key elements of the Matrix, its stages, fundamental images and analytical schemes through which the unfolding of form in biological, geological, cosmic, and cultural and symbolic material will be described.

Chapter Six

The Circle-Seed as the Initial Structure

6.1. The Seed as a Model of Potential Form

Within the hypothesis of the Unified Matrix of the Universe, the image of the seed occupies a special place. It allows the initial state of form to be described not as emptiness, absence or indeterminate matter, but as condensed potentiality. The seed is one of the most expressive natural objects in which the future form has not yet unfolded, but is already present as a possibility. It is small, enclosed and often outwardly simple, yet internally connected with an immense process of future unfolding: growth, the formation of an axis, root, stem and leaves, flowering, fruiting, and a new cycle of seed formation.

The seed must be considered first and foremost as a biological object. It arises within the life cycle of a plant, carries hereditary information, contains an embryo, reserves of nutrients or structures that support the initial stages of development, and possesses protective coverings that safeguard its internal contents. For the present hypothesis, however, the seed is important not merely as an object of botany. It serves as a morphological model of potential form. A general principle can be discerned within it: form has not yet been given explicitly, yet is already present as a direction, a possibility, an internal organisation and a capacity for future becoming.

This distinction between manifest and potential form is crucial. A mature plant is directly visible: it has a stem, leaves, branches, flowers, fruits and a root system. None of these is outwardly displayed by the seed. In a literal sense, it does not resemble a tree or a flower. Yet it is precisely within the seed that the possibility of the future tree or flower resides. The seed therefore demonstrates a fundamental property of morphogenesis: form may exist prior to its manifestation, not as a completed miniature, but as a structural possibility.

This understanding is important in overcoming a naïve conception of form. Form is not always a visible contour. It may be concealed, folded, encoded or held in potential. The seed demonstrates that visible simplicity may conceal an extraordinarily complex organisation. A small object may be the beginning of a large process. A closed structure may contain the possibility of future openness. A dormant state may represent not lifeless repose, but a state awaiting the conditions required for unfolding.

In biological terms, a seed does not contain the mature plant as a reduced copy. It contains the possibility of development, realised only through the interaction of internal factors and external conditions. Germination requires water, an appropriate temperature, oxygen, sometimes light, suitable soil conditions and the absence of adverse influences. This means that the seed's potential is not absolutely self-sufficient. It must enter into a relationship with its environment. Form arises not only from an internal code, but also from the conditions in which that code is realised.

This proposition is fundamental to the hypothesis of the Matrix. If the seed is used as a model of potential form, the Matrix cannot be understood as a closed programme that mechanically produces a result independently of its environment. On the contrary, the seed demonstrates that potential form unfolds only through interaction. The internal order defines the range of possibilities, while the environment determines the particular path of unfolding. The same plant grown under different conditions may vary in height, crown shape, leaf size, intensity of flowering and degree of branching. The type is preserved, but its realisation varies.

In this sense, the seed is a model not of rigid predetermination, but of directed possibility. It does not guarantee a single possible outward appearance; rather, it defines a morphogenetic range. An oak seed will not produce a fern, but every oak will be individual. The seed of a flower will not produce a stone, but every flower will possess its own distinctive features. The seed therefore combines the stability of type with the variability of form. It is precisely this conjunction that matters to the hypothesis of the Unified Matrix of the Universe: the universal principle does not abolish individuality, but is realised through it.

The seed also demonstrates the connection between form and time. Within it, the future is present in the present as a possibility. The seed is an actual, material and visible structure, yet its meaning is revealed only over time. Until it has germinated, a significant part of its form remains concealed in the future. The seed may therefore be described as a temporally condensed form. It contains not only matter, but also the direction of a future process. In this sense, the seed is not merely an object, but the beginning of a morphogenetic sequence.

This sequence may be described as a transition from the closed to the open. The seed is enclosed. It is separated from its environment by a covering. Its internal structure is protected, gathered together and concealed. During germination, this enclosed state is disrupted. The covering ceases to be the final boundary. The first outward emergence occurs. The root grows downwards and the shoot upwards. An axis, polarity and differentiation of directions appear. That which had been gathered within begins to unfold into external space. Through this transition, the seed becomes a model of the primary breaking of symmetry.

It is for this reason that the seed is closely associated with the image of the circle. Many seeds have a rounded, oval, teardrop-shaped, grain-like or compact form. Yet even where a geometrical circle is not strictly expressed, the seed is morphologically associated with the idea of an enclosed whole. It is organised around an internal potential. It possesses a covering and a boundary. It separates the internal from the external. It preserves the possibility of future unfolding. Within the hypothesis of the Unified Matrix of the Universe, therefore, the seed may be associated with the model of the ‘circle-seed’: an initial form in which the whole has not yet unfolded, but is already present as potential.

It must be emphasised that the ‘circle-seed’ does not imply that all natural forms literally begin with a round seed. Such a formulation would be excessively crude and incorrect. What is meant is a morphological model of initial wholeness. The circle denotes enclosure, symmetry, potentiality and internal order. The seed denotes the capacity of this enclosed structure to enter into development. The conjunction of these images produces a model of the Matrix’s initial state: a closed, condensed and potential form capable of unfolding.

The seed demonstrates that the initial form is not empty. This is particularly important for a philosophical understanding of the hypothesis. A beginning is often conceived in terms of absence: there is as yet no stem, no leaves, no flower and no fruit. In the seed, however, this ‘not yet’ does not signify absolute emptiness. On the contrary, it signifies concealed fullness. The

plant's future organs are not present as completed external components, but they are present as possibilities of development. The seed may therefore be regarded as a form in which the absence of external unfolding is combined with internal richness.

In philosophical terms, the seed expresses the category of potential being. The potential is not nothing. It is real, but has not been fully manifested. It exists as a capacity, a direction and a possibility of becoming. The seed is real in the present, yet its full form lies ahead. Within it, the present and the future are connected in a distinctive way. This is why the seed constitutes such a powerful model of morphogenesis: it demonstrates that the becoming of form begins before its visible unfolding.

This idea relates directly to the hypothesis of the Matrix. If the Matrix is understood as a principle governing the structural organisation of form, its initial state should not be conceived as a completed complex structure. Rather, it should be understood as a potential whole capable of successive unfolding. The seed provides precisely this image: an initial simplicity that is not primitiveness; enclosure that is not barren closure; rest that is not the absence of process; and a small scale containing the possibility of extensive unfolding.

The seed also helps to clarify the relationship between the internal and the external. Before germination, the seed's internal structure is concealed. Outwardly, it may appear to be an almost homogeneous body. Internally, however, distinctions already exist: the embryo, the covering, storage tissues and zones of future growth. During germination, the internal becomes external. The root and shoot extend beyond the covering. Internal organisation begins to manifest itself in space. Morphogenesis may therefore be understood as a process through which a concealed structure is externalised: what was an internal possibility becomes an external form.

This externalisation, however, is not the mechanical unfolding of a pre-formed component. The plant does not exist within the seed as a folded model. It emerges through development. The seed thus demonstrates the subtle distinction between 'containing form' and 'containing the possibility of form'. This distinction is particularly important to the hypothesis of the Matrix. The Matrix should not be understood as a completed design folded inside every object. Rather, it is a structural possibility realised through process, environment and interaction.

The seed is also associated with the concept of a threshold. Until the necessary conditions are present, a seed may remain dormant. It exists in a state of waiting. Once certain conditions have been attained, however, germination begins. The transition from the potential to the actual thus has a threshold character. Form does not unfold gradually at all times and in all places; it enters a developmental phase when a particular combination of internal and external factors arises. In the terminology of self-organisation, the system may be said to pass from one state to another when the previous equilibrium ceases to be stable.

Such a threshold transition is important to an understanding of the Matrix. The initial state of form may be stable, enclosed and symmetrical. This stability, however, is not absolute. When conditions change, the form may begin to unfold. The seed swells, its covering is breached and a direction of growth emerges. This constitutes the first act of morphogenetic differentiation. In a broader sense, comparable transitions may also be observed in other systems: crystallisation begins from a nucleus, a crack from localised stress, a river channel from an initial flow, a nebula from an instability in the distribution of matter, and a symbolic form from the emergence of a centre or axis within a composition. In every case, there is a moment at which a potential structure becomes manifest.

The use of the seed as a universal model naturally requires caution. A seed is a biological object and cannot be transferred literally to geology or the cosmos. A stone is not a seed. A nebula is not a seed. A cultural symbol is not a seed in the biological sense. The seed may, however, be used as a model of initial potential. In geology, an analogue of the seed function may be provided by a nucleus of crystallisation, a centre of pressure, an incipient crack, an inclusion or a zone of stress. In a cosmic form, it may be represented by a region of matter concentration, the centre of a gravitational condensation, the source of an outflow or an initial inhomogeneity. In culture, it may take the form of a compositional centre, a primary sign or a point around which sacred space is organised.

Such an extension does not imply identity. It implies morphological comparison. The seed as a biological object possesses its own mechanism. A nucleus of crystallisation possesses a physicochemical mechanism. The centre of a nebula is astrophysical. The compositional centre of a symbol is cultural. At the level of form, however, all may perform a similar structural function: serving as the beginning of unfolding, a region of concentration or an initial point of organisation. It is this function that matters to the concept of the ‘circle-seed’ within the hypothesis of the Matrix.

The seed also demonstrates the relationship between a small form and a large structure. Here, smallness does not imply insignificance. A small object is capable of generating an immense system. This is particularly apparent in the tree: a small seed may become a trunk, roots, a crown, leaves, flowers, fruits and a multitude of new seeds. The scale of the future form is incommensurable with that of the initial object, yet the connection between them is real. The seed initiates large-scale expansion. In this sense, it is naturally associated with fractality: the whole plant will subsequently reproduce its own principle in its branches, leaves, veins and new seeds.

The fractal aspect of the seed is manifested at an even deeper level. The seed produces a plant, the plant produces numerous seeds, and each seed is capable of producing a new plant. Here, part and whole enter into a cyclical relationship. The seed is part of the plant, yet simultaneously contains the possibility of a new whole. The plant is a whole in relation to the seed, yet itself becomes one stage in a broader reproductive cycle. The seed thus demonstrates that a part may carry the principle of the whole. This is one of the most important propositions of fractal thought and of the hypothesis of the Matrix.

The seed also provides a means of understanding cyclicality. The morphogenesis of a plant does not end with the flower or fruit. The fruit returns the process to the seed. This is not, however, a simple repetition of what came before. The new seed contains the possibility of a new plant, which will be similar in type but individual in form. The seed cycle is therefore a return with difference. This is particularly important to an understanding of the Matrix not as mechanical repetition, but as a living morphogenetic sequence. Form returns to its beginning, but that beginning has already been incorporated into a new cycle.

In this sense, the seed combines linearity and cyclicality. The plant’s development is linear: the seed germinates, a shoot appears, and leaves, a stem, a flower and fruit are formed. The life process, however, is cyclical: the fruit returns to the seed. Morphogenesis moves forwards while simultaneously returning to its initial potentiality. This structure possesses profound philosophical significance. It demonstrates that development need not be a straight line without return, nor a closed circle without novelty. It may be spiral: the return to the beginning takes place at a new level.

The seed is therefore associated not only with the circle, but also with the spiral. The circle expresses initial wholeness and enclosure. The seed expresses the potential for development. The spiral expresses repetition with change. All these elements are combined in the plant's life cycle: the seed as circular potentiality, growth as axial unfolding, branching as multiplicity, flowering as radial manifestation, the fruit as a return to the seed, and the new cycle as spiral continuation. The general code of the Matrix can already be discerned in this sequence.

The seed is also important to an understanding of the boundary. Its covering protects the interior. It separates the potential from the external environment, but not permanently. At the appropriate moment, the boundary must be breached, opened or overcome. If the covering remains completely closed, development cannot begin. If it is destroyed too early or in the wrong manner, the seed may die. The seed boundary therefore performs a dual function: preservation and the possibility of unfolding. This is a fundamental morphogenetic principle. The boundary does not merely delimit form; it regulates the transition between the internal and the external.

Within the hypothesis of the Matrix, this means that a closed form does not negate development. It is a condition for the accumulation of potential. Enclosure is necessary to preserve internal order. Development, however, requires that this enclosure be overcome. As a model, the seed demonstrates that every form has its moment of unfolding. Before this moment, enclosure is productive. After it, enclosure must give way to growth. The transition from the circle to the axis, from the covering to a direction, and from the internal to the external thus takes place.

The seed may also be regarded as a model of minimal wholeness. It contains everything necessary to initiate development, yet does not contain an excess of unfolded complexity. It is a minimal whole. It is neither a part devoid of autonomy nor a fully developed system. It occupies a position between part and whole. On the one hand, the seed is part of the plant's life cycle. On the other, it is capable of becoming a new whole. This duality makes the seed an exceptionally important philosophical object.

In the context of the hypothesis of the Unified Matrix of the Universe, this duality helps to explain how the Matrix may operate at different scales. What is a part at one level may become the centre of a new level. A tree branch may serve as an axis for new branches. A leaf vein may become a distribution centre for smaller veins. A river tributary may possess its own network. A small crack may generate secondary cracks. A cultural symbol may become the centre of a new composition. The seed demonstrates this principle with particular clarity: a part of one whole becomes the beginning of another.

The seed also demonstrates a concealed hierarchy. Outwardly, it may appear to be a single body, but its internal structure is organised. It contains coverings, an embryo, storage tissues and zones of future growth. This concealed differentiation has not yet manifested itself as the external architecture of the plant, but it already exists as internal order. The seed thus demonstrates that an initial form may be internally complex even when it appears outwardly simple. This is important to an understanding of the Matrix as a closed structure: initial wholeness is not equivalent to empty homogeneity.

The distinction between simplicity and primitiveness must be emphasised here. The seed is simple in outward appearance, but not primitive in significance. Its simplicity is condensed complexity. Similarly, the circle as the Matrix's initial form should not be understood as an impoverished geometrical figure. The circle may express integration, equilibrium, symmetry and potential fullness. The seed adds a dynamic dimension to the circle: the capacity for unfolding. The 'circle-seed' is therefore not a static figure, but the initial stage of a process.

In scientific and philosophical language, the seed may be described as a model of latent organisation. The latent is concealed, but not absent. The organisation of the seed is latent because it has not yet been expressed in the form of the mature plant. It is nevertheless real, because under certain conditions it is capable of directing development. The seed is therefore one of the best natural examples of the way in which structure may precede visibility. The Matrix as a hypothesis addresses precisely this problem: visible form may be the manifestation of a concealed order.

Concealed order, however, should not be understood as a mystical secret. In the biological seed, it has specific material foundations. In other systems, concealed order may likewise have natural causes: the distribution of stresses, chemical composition, crystalline structure, density of matter, a force field or a compositional intention. The hypothesis of the Matrix should therefore use the image of the seed not to mystify, but to clarify: form may be prepared before it appears, and its visible unfolding has internal preconditions.

The seed also allows the concept of a beginning to be understood in a new way. A beginning is not always a point in time after which everything arises from nothing. It may be a state of condensed fullness. Within the seed, the beginning already contains a preceding cycle: the seed emerged from the fruit, the fruit from the flower, the flower from the plant, and the plant from a previous seed. The seed is therefore a beginning only in relation to a new cycle. There is no absolute beginning here; there are transitions between cycles. This is important to the hypothesis of the Matrix, since every initial form may be not a first beginning, but a node within a broader chain of becoming.

In this sense, the ‘circle-seed’ combines beginning and memory. The seed initiates new growth, but is itself the result of a preceding process. In condensed form, it bears the trace of prior development. Within it, the past is transformed into the possibility of the future. This relationship between past and future makes the seed not merely an object, but a temporal node. It connects completion with beginning. It is for this reason that the seed is one of the most powerful images of the cyclical Matrix.

For the further development of the hypothesis, the principal characteristics of the seed as a model of potential form should be identified:

- first is enclosure: the seed separates the internal from the external;
- second is compactness: future complexity is contained in a condensed state;
- third is potential: the form has not yet manifested itself, but is possible;
- fourth is internal organisation: the seed is not empty, but structured;
- fifth is threshold dependence: development begins under particular conditions;
- sixth is axial unfolding: germination creates a direction;
- seventh is cyclicality: the seed is simultaneously a result and a beginning;
- eighth is scalability: the small contains the possibility of the large.

These characteristics may be used as an analytical framework for comparison with other forms. In a crystal, for example, one may seek a growth nucleus, internal order, a crystallisation threshold and the unfolding of structure. In a geological crack, one may examine concealed stress, a point of origin, the direction of propagation and the manifestation of the rock’s internal state. In a nebula, one may examine a region of concentration, boundaries, shells and the transition to an unfolded structure. In a cultural symbol, one may identify a central sign, a closed composition, a potential meaning and its subsequent unfolding into an ornament or mythological

schema. In every case, however, it must be remembered that this is not a literal seed, but a functional analogue of initial potential.

Thus, within the hypothesis of the Unified Matrix of the Universe, the seed serves as a model of potential form. It demonstrates that form may exist before its visible unfolding; that initial enclosure may be rich in internal order; that development begins with the breaching of a covering and the emergence of an axis; that the small may contain the possibility of the large; and that a completed form returns to a new beginning. The seed unites potential, structure, time, boundary, cycle and future.

It is for this reason that the seed is the first element of the 'circle-seed' model. It gives the circle a dynamic meaning. The circle denotes initial wholeness, but the seed demonstrates that this wholeness is not static. It is capable of germinating, unfolding, breaking symmetry and forming an axis, layers, branches, a periphery and a new cycle. In this sense, the seed is not only a biological object, but also one of the key philosophical and morphological models within the hypothesis of the Unified Matrix of the Universe.

6.2. The Circle as the Topology of Initial Wholeness

If, within the hypothesis of the Unified Matrix of the Universe, the seed serves as a model of potential form, the circle expresses the topology of that potentiality. Here, the circle should be understood not merely as a geometrical figure, but as an image of initial wholeness, enclosure, symmetry and internal order. It denotes a state in which form has not yet entered unfolded space and has not yet acquired a pronounced axis, layers, branching or peripheral complexity, but already possesses coherence and the possibility of future unfolding.

The circle is one of the most ancient and universal forms of human perception. It is associated with the sun, the moon, the pupil of the eye, fruit, the seed, the egg, the horizon, the celestial vault, the cycle of time, rotation, the wheel, the mandala, the orbit and numerous cultural symbols of wholeness. In the present hypothesis, however, the circle should not be regarded primarily as a cultural sign. Its significance is more fundamental: the circle makes it possible to describe the initial state of form as a closed system in which all directions remain equivalent and the distinction between centre, axis and periphery has not yet been fully unfolded.

In geometrical terms, the circle establishes a particular relationship between centre and boundary. Every point on the circumference lies at an equal distance from the centre. This creates a simple but fundamental structure: centre–radius–boundary. Even before the circle has unfolded into a complex form, it already contains the possibility of future organisation. The centre may become a point of concentration, the radius a direction of propagation and the boundary the limit of initial wholeness. The circle is therefore not an empty figure. It contains the minimal structure of morphogenesis.

Within the hypothesis of the Matrix, the circle serves as the topology of initial wholeness precisely because it combines enclosure with potential directionality. On the surface, the circle may appear fully complete: it is closed, continuous and symmetrical, with no explicit beginning or end. Viewed morphogenetically, however, it may be understood as a state prior to unfolding. No axis has yet been distinguished, symmetry has not yet been broken and branching has not begun, yet an internal organisation capable of developing into a more complex structure is already present.

The circle as initial wholeness should not be understood as a final form. In the context of the hypothesis, it is an initial state, not an endpoint. It is comparable to a seed, an egg, an embryonic centre, a nucleus of crystallisation, an initial droplet, a compact cloud, a closed bud or a primary sign. These forms may differ in their nature, yet they express the same morphological situation: something has been gathered together, delimited and separated from the external; it retains an internal order and is potentially prepared for transition.

The circle is therefore associated with the concept of the boundary. The circumference separates the internal from the external. It creates an area within which form may be conceived as a whole. Without a boundary, there is no initial wholeness: everything disperses into indeterminate space. Yet the boundary of the circle does more than separate. It also preserves. It retains internal potential, protects it from dispersion and creates the conditions required for accumulation. In this sense, the circle resembles the seed covering: a closed boundary does not negate development, but provides the conditions for its preparation.

The circular boundary has a dual character. On the one hand, it closes the form. On the other, it defines a limit that may subsequently be overcome. A seed germinates by breaching its covering. A bud unfolds by overcoming the enclosure of its petals. A crystal grows beyond the limits of its initial nucleus. A crack disrupts the previous wholeness of a material. A nebula may expand beyond the initial concentration of matter. A symbolic composition may unfold from a central circle into an ornamental structure. The circle within the Matrix should therefore be understood not as motionless enclosure, but as a boundary prior to unfolding.

The circle is also associated with symmetry. In an initial circular form, every direction from the centre to the periphery is equivalent. There is as yet no principal axis, no differentiated top or bottom, and no preferred direction of branching. This state may be described as equilibrium potentiality. The form is integrated, but has not yet determined how or in which direction it will unfold. From a morphogenetic perspective, this state is important because development begins with the disruption of this equivalence. As soon as one direction is distinguished, an axis emerges. As soon as differences between zones appear, differentiation begins. As soon as the boundary ceases to be uniform, an active edge arises.

The circle within the hypothesis of the Matrix is therefore not merely a sign of symmetry, but also the point from which symmetry is broken. It represents a state that must be overcome if form is to develop. If symmetry remains complete, the structure stays closed. If symmetry is broken destructively, the form may disintegrate. If, however, symmetry breaking becomes organisational, morphogenesis occurs: the centre acquires direction, the boundary opens, an axis emerges, followed by layers, branching, a periphery and a new structure.

This logic is particularly evident in biology. A seed often possesses a compact, rounded or oval form. While dormant, its external organisation remains relatively enclosed. Germination, however, disrupts this wholeness. The radicle and shoot establish directions that were not previously visible. A vertical polarity emerges: downwards and upwards, root and stem, the concealed and the open, earth and light. Circular or oval potentiality becomes axial organisation. Thus begins the unfolding of the Matrix.

A bud may likewise be regarded as a circular or spheroidal model of initial wholeness. It is closed, layered, protected and organised around a concealed centre. Its petals have not yet opened, and their radial structure remains hidden. At the moment of flowering, however, the closed form reveals the centre, periphery, layers and active edges of the petals. The bud demonstrates that

circular enclosure may contain a complex internal architecture. Unfolding does not create form from nothing; it makes visible a structure prepared within.

In geology, circular or approximately circular form may be manifested in crystalline nuclei, mineral inclusions, rounded stones, concretions, craters, domes, volcanic centres, ring structures, radial cracks and concentric layers. Here, the circle is not a biological seed, but may perform a similar morphological function: denoting a region of concentration, enclosure, pressure, growth or propagation. Of particular interest are structures in which cracks, layers, radial lines or wave contours extend from a circular or central nucleus. They reveal how a closed form passes into outward unfolding.

In cosmic objects, circular and spherical topology is associated with gravity, rotation, expansion, shells and the distribution of matter. Stars, planets, certain nebular shells, ring structures, shock-wave regions and gaseous spheres may exhibit centred organisation. These forms naturally have physical origins distinct from those found in biology and geology. At the morphological level, however, they likewise display the relationship between centre, radius and boundary. A cosmic circle or shell may be regarded as a form in which matter is organised around a centre or an initiating event.

The circle has an especially rich history in culture. It is associated with wholeness, eternity, the heavens, time, repetition, protection, sacred space, the cosmos and order. The mandala, rose window, circular ornament, solar disc, wheel, halo, calendrical cycle and the circular layout of a settlement or temple all demonstrate that human consciousness has perceived the circle as a sign of ordered wholeness. Within the hypothesis of the Matrix, however, the cultural circle should be regarded not as evidence of a natural law, but as a symbolic formulation of the same morphological idea: an enclosed, centred order.

The circle consequently possesses several levels of meaning. At the geometrical level, it is a figure in which the distance from the centre to the boundary is constant. At the topological level, it is an enclosed region separating the internal from the external. At the morphogenetic level, it is the initial state of potential form. At the philosophical level, it is an image of wholeness and possibility. At the cultural level, it is a symbol of order, cycle and sacred space. The hypothesis of the Matrix employs all these meanings, but must distinguish between them in order not to conflate the scientific, morphological and symbolic levels.

The concept of topology is especially important. In the present context, the topology of the circle does not mean mathematical topology in its strict specialist sense, but the mode of spatial organisation of an initial form. The circle establishes an area, a centre, a boundary and a uniform relationship between centre and periphery. It need not be geometrically perfect. In nature, initial wholeness may be oval, spherical, teardrop-shaped, grain-like, irregular, slightly elongated, compressed or deformed. What matters is not absolute conformity to a circumference, but the principle of an enclosed, centred form.

This qualification is necessary because natural forms are rarely perfect. A seed may be elongated rather than round. A bud may be asymmetrical. A stone may possess an irregular roundness. A nebula may form a ruptured shell. A cultural circle may be stylised. If, however, a form preserves the principle of enclosed wholeness, a centre and a boundary, it may be included within the circular topology of the Matrix. What matters here is not mathematical precision, but morphological function.

The circular topology of initial wholeness is also associated with the concept of internal order. A closed form is not chaos. It may be outwardly simple, yet internally organised. A seed possesses an embryo and an internal structure. An egg possesses internal polarity and developmental potential. A bud contains folded petals. A crystalline nucleus contains the possibility of lattice growth. A geological inclusion may preserve the history of matter. A cosmic shell may retain the trace of an event. A symbolic circle may contain a centre, levels, directions and a concealed compositional logic. The circle as an initial form is therefore not empty, but charged with potential.

This proposition is important to the following section on closed form and concealed structure. It must already be emphasised that initial wholeness is not equivalent to the absence of structure. On the contrary, it is a form in which structure has not yet unfolded outwards. The circle denotes not ‘nothing’, but ‘that which has not yet unfolded’. It represents a state in which future differences are gathered within. Development does not create order from absolute emptiness; it manifests, intensifies and transforms a concealed organisation.

The circle is also associated with equilibrium. Within a closed form, the internal and external remain separated by a stable boundary. Symmetry has not been broken, or has been broken only minimally. The system preserves itself. This equilibrium, however, may be either final or preparatory. If the circle is a completed form, further development does not necessarily follow. If it is a seed, egg, bud, nucleus or potential structure, however, equilibrium becomes temporary. It must be disrupted for growth to begin.

In this sense, the circle may have two different meanings: completion and beginning. In certain cultural and philosophical traditions, the circle denotes fullness, completion, eternity and return to itself. The Matrix hypothesis retains this meaning, but adds another: the circle is the beginning of unfolding. It is complete as an initial whole, but incomplete as a morphogenetic process. It is potentially full, but not actually unfolded. This duality is precisely what makes it so important.

The circle as initial wholeness also constitutes a minimal model of the relationship between ‘one’ and ‘many’. Within the initial circle, the many have not yet been differentiated. Branches, layers, petals, directions, edges and secondary centres have not yet emerged as separate elements. They may, however, arise from the single structure. The development of form transforms the one into the many while preserving a connection with the original centre. In this sense, the circle is the beginning of differentiation. It contains the possibility of multiplicity not yet separated from unity.

This idea relates directly to fractality. If the initial whole gives rise to a structure capable of reproducing its principle in its parts, the circle becomes not merely the beginning of a single form, but the beginning of a scalable process. The seed produces a plant, the plant produces branches, the branches produce smaller branches, leaves produce veins, and fruit produces new seeds. The initial circle as potentiality may unfold into a system of self-similar forms. Circular wholeness and fractal branching are therefore not opposites, but stages of a single process.

The circle also helps to clarify the relationship between centre and periphery. In the initial circular form, the periphery remains simple: it is expressed as a boundary. During development, however, the periphery becomes more complex. In a leaf, the edge becomes undulating, serrated, dissected or otherwise complex. In a flower, the periphery is manifested in the petals. In a river network, it is associated with numerous small tributaries and the boundaries of the drainage basin. The edge of a nebula may be ruptured, filamentary or multilayered. The development of the

Matrix may therefore be described as the complexification of the initial circumference: the simple boundary becomes an active edge.

This understanding is especially important in distinguishing the Matrix from simple circular symbolism. If the circle remained only a circle, it would express static wholeness. Within the hypothesis, however, the circle is the beginning of dynamics. Its boundary must open, become more complex, and develop into a petal, leaf margin, fault line, shell, ornament, spiral or network. The Matrix begins with the circle, but does not end with it. The circle is the initial topology from which subsequent morphology arises.

The circle is also associated with the concept of 'internal space'. Within the circumference, a region arises that differs from what lies outside. This is the simplest model of interiority. In biology, the interior of the seed is protected by its covering. In geology, the internal stress of rock may manifest itself externally through a crack. In the cosmos, an internal region of a nebula may be the source of expansion or radiation. In architecture, a circular or centred form may create a sacred interior space. In symbolism, the circle separates ordered space from the chaos outside. The circle thus establishes the fundamental opposition between internal and external.

This opposition, however, is not absolute. Morphogenesis begins when the internal and external enter into exchange. A seed absorbs water. A bud responds to light, temperature and internal growth. A crystal interacts with a solution or melt. A stone is subjected to pressure and weathering. A cosmic shell interacts with the interstellar medium. A symbolic circle acquires meaning through perception and interpretation. The circular boundary must therefore be understood as a transitional zone rather than an impermeable wall.

In this sense, the circle is associated with the future active edge. The initial circumference is a simple boundary, but during unfolding it becomes a complex periphery. It may be said that the active edge is already potentially present within the circumference. While the form is closed, the edge is uniform and protective. When the form unfolds, the edge becomes a zone of growth, contact, exchange and variation. This reveals the continuity between the circle-seed and leaf-like unfolding: the boundary of initial wholeness becomes the edge of the unfolded form.

The circle also relates to the concept of a cycle. The circumference returns to itself and has no linear beginning or end. This makes it a natural image of repetition, rhythm and return. In the biological cycle, the seed returns through plant, flower and fruit to a new seed. In geological processes, destruction and accumulation may create cycles of material transformation. In cosmic processes, matter may pass between states, participating in new structures. In culture, the circle is associated with the calendar, ritual, repetition and eternal return. Circular topology therefore expresses not only space, but also time.

Within the hypothesis of the Matrix, however, the cycle should not be understood as the simple repetition of the same. Morphogenesis entails a return with difference. The new seed is not identical to the previous one. A new layer is not the same as the old. A new symbol does not fully repeat the previous meaning. The circle as a cycle must therefore be supplemented by the spiral as a model of development. The circle expresses return; the spiral, return at a new level. Yet the circle remains the initial image, establishing the idea of wholeness to which the process may return.

Circular topology also helps to explain why numerous cultural systems associate the circle with the sacred. Sacred space is often conceived as separated, centred, protected and organised. The circle expresses these characteristics perfectly. Within the hypothesis of the Matrix, however,

this cultural meaning should not be detached from morphology: the circle is indeed a powerful form for separating internal order from external space. The cultural symbolism of the circle may therefore be understood as a hermeneutic development of its morphological function.

In architecture, the circle and related forms—the dome, rotunda, circular temple, centralised plan, domed roof and circular square—likewise express centred organisation and wholeness. Here, the circle becomes an artificial rather than a natural space. Human beings create a form that organises space around a centre and boundary. Architecture thereby translates circular topology into a lived environment. A person enters the circle, occupies its centre, moves along radial or circular directions and perceives the boundary as an organising shell. This represents an important cultural and spatial level of the Matrix.

Here too, however, the levels must be distinguished. A circular temple does not prove the existence of a natural Matrix. It demonstrates that circular topology possesses cultural and spatial significance. Human beings employ it to express order, centred organisation, protection, sacred space and connections between levels. In this book, it may be incorporated into the hermeneutic level of analysis, but should not be conflated with the natural-scientific level.

The circle as an initial structure is also associated with the concept of the whole prior to its parts. In a developed form, the parts are distinguishable: root, stem, leaf and flower; layers, cracks and edges; centre, arms and shells; axis, branches and tiers. In the initial circle, however, the parts have not yet separated. The whole precedes explicit differentiation. This does not mean that no internal structure exists, but that it has not yet been expressed as an articulated system. The circle represents the whole in a state prior to division. Morphogenesis transforms this concealed whole into manifest multiplicity.

This understanding helps to clarify the philosophical position of the hypothesis. The Matrix does not begin with a chaotic set of parts. It begins with a whole that subsequently differentiates. This distinguishes a morphogenetic approach from mechanical assembly. In mechanical assembly, the whole arises from components that are already separate. In morphogenesis, parts become differentiated from a developing whole. The seed does not assemble the plant from external components; it unfolds its internal potential through interaction with the environment. The circle as initial wholeness expresses precisely this logic.

The wholeness of the circle, however, should not be understood as the absolute predetermination of every detail. The initial form contains not a completed result, but a field of possibilities. The circular Matrix is therefore not a blueprint of components, but a topology of potential. It establishes the relationship between centre, internal space and boundary, from which different trajectories of unfolding may arise. Depending on the conditions, such a trajectory may result in axial growth, radial unfolding, branching, spirality, layering or a complex edge.

This is what makes the circle a universal initial model. It is sufficiently simple to express initial wholeness and sufficiently rich to contain the possibility of future differences. It already possesses a centre and a boundary, but not yet full differentiation. It is symmetrical, but its symmetry may be broken. It is closed, but may unfold. It is finite, but may initiate a cycle. It is simple, but may carry concealed complexity. The circle is therefore a natural topology for the initial state of the Matrix.

The subsequent analysis must demonstrate how an axis emerges from the circle. This transition is one of the most important moments in the hypothesis. As long as the circle retains uniform symmetry, form remains potential. When one direction is distinguished, the first act of

morphogenesis occurs. The circle-seed thus becomes a shoot, the centre becomes an axis, enclosure becomes unfolding and equilibrium becomes differentiation. The circle is therefore not the endpoint of the argument, but a preparation for the subject of concealed structure and symmetry breaking.

Thus, within the hypothesis of the Unified Matrix of the Universe, the circle serves as the topology of initial wholeness. It expresses enclosure, symmetry, potentiality, internal order, the relationship between centre and boundary, the separation of the internal from the external, and the possibility of future unfolding. In conjunction with the image of the seed, the circle forms a model of the Matrix's initial state: a condensed and protected form, outwardly simple but internally rich, which under certain conditions is capable of developing an axis, layers, branching, a periphery and a new cycle of form generation.

6.3. The Closed Form and Hidden Structure

The concept of closed form occupies an important place within the hypothesis of the Unified Matrix of the Universe. Having considered the seed as a model of potential form and the circle as the topology of initial wholeness, it is necessary to clarify what lies concealed behind this enclosure. A closed form should not be understood as an empty shell, a passive boundary or an outwardly complete but internally insubstantial figure. On the contrary, in a morphogenetic sense, a closed form may be rich in concealed structure. It has not yet unfolded into an axis, layers, branching and a periphery, but it already contains the internal order that makes subsequent development possible.

This proposition is fundamental to the hypothesis as a whole. If the initial state of form is understood as emptiness, development would have to originate externally: someone or something would have to introduce structure into an initially formless state. The hypothesis of the Matrix, however, proceeds from a different logic. Form arises not as something externally imposed upon empty matter, but as the unfolding of a concealed organisation. The initial state may be outwardly simple, compact, symmetrical and closed, while already containing internal differences, stresses, potentials, directions, gradients or conditions for future differentiation.

The seed is the clearest example of such a closed form. Outwardly, it may appear to be a small, homogeneous and enclosed object. Internally, however, the seed contains an embryo, coverings, nutrient reserves, zones of future growth, biological information and the capacity to enter a new state. While the seed remains dormant, this structure is not visible in its external appearance. It is nevertheless real. It is precisely this concealed organisation that distinguishes a living seed from a chance rounded pebble or an empty capsule. The seed is a closed form in which the future has already been prepared, although it has not yet manifested itself.

Closed form as a model is not, however, confined to biology. In different domains of nature, there are states in which structure remains concealed until the moment of manifestation. A crystal may begin to develop from a small nucleus in which the principle of its future lattice is already established. Geological rock may retain internal stress for an extended period before it becomes manifest in a fold or crack. A stone may contain layers, inclusions, veins and lines of future fracture that are not always visible at the surface. A cloud of gas and dust may contain regions of density that later become centres of star formation. A cultural symbol may be outwardly simple, yet contain a complex system of meanings that unfolds in ritual, myth, architecture or ornament.

Closed form therefore signifies not the absence of process, but its concealed phase. It is a state prior to explicit unfolding, but not prior to all organisation. It may be a phase of accumulation, protection, maturation, stabilisation, concentration or waiting for appropriate conditions. In this sense, closed form is a morphogenetic reservoir. It retains an internal possibility and prevents it from dispersing. Its boundary preserves potential until the system can proceed to unfold.

The boundary plays a decisive role here. It separates the internal from the external, but does not merely isolate. It creates the conditions required to preserve internal order. In the seed, the covering protects the embryo. In the bud, folded petals enclose the future flower. In the egg, the shell separates the developing system from the external environment. In a crystalline nucleus, the boundary separates a region of ordering from the surrounding material. In a cultural composition, a circular frame or closed contour separates sacred or semantic space from what lies outside. The boundary of a closed form is therefore not a passive limit, but an active condition of morphogenesis.

This boundary, however, cannot remain completely impermeable. If a closed form never interacts with its environment, it cannot unfold. A seed must absorb water. A bud must open. A crystal must interact with a solution or melt. Rock must undergo pressure, rupture or weathering. A cosmic cloud must pass through the dynamics of density, gravity, radiation and motion. A symbol must be perceived and interpreted. Closed form therefore always exists between preservation and unfolding. It must retain internal order while, at a certain point, allowing that order to emerge.

It is precisely this duality that gives closed form morphogenetic significance. Complete openness would destroy potential before it had matured. Complete closure would arrest development. Closed form functions as the temporary retention of structure. It preserves form in a concealed state until conditions allow it to become manifest. Enclosure is therefore not the opposite of development. It is its preliminary phase.

In this context, closure must be distinguished from emptiness. A closed form may be empty if it contains no organising potential. The Matrix hypothesis, however, concerns a different type of enclosure: enriched closure. Such a form is outwardly delimited, but internally active. It may be dormant, yet this dormancy does not imply the absence of life, energy or process. It is the repose of charged possibility. The form does not yet move explicitly, but is already capable of movement. It has not yet become articulated, but already carries the possibility of differentiation.

This enables the meaning of concealed structure to be clarified. Concealed structure is not necessarily a structure that can never be seen. It may sometimes be revealed by sectioning, microscopy, analysis, modelling or reconstruction. In ordinary external perception, however, it is not manifest. It may be chemical, mechanical, biological, geometrical, energetic, informational or symbolic. What matters is that it precedes the visible unfolding of form and makes that unfolding possible.

In biology, concealed structure may be associated with genetic information, cellular organisation, internal gradients, embryonic regions, tissue potentials, mechanical stresses and bioelectrical states. In geology, it may be associated with the crystal lattice, mineralogical composition, internal pressure, microcracks, layers, inclusions and the direction of stresses. In the cosmos, it may be associated with density distribution, gravitational potential, magnetic fields, gas motion and initial inhomogeneities. In culture, it may be associated with mythological context, a compositional schema, a canon, ritual function and the historical memory of a symbol.

Concealed structure is therefore always specific. It must not be transformed into an abstract mystery. In every system, it has its own substrate and mechanism. In biology, it is not the same as in geology. In geology, it is not the same as in the cosmos. In culture, it is not the same as in nature. At the morphological level, however, concealed structure performs a similar function: it retains the possibility of a future form until its manifestation. It is this function that makes it possible to incorporate different phenomena into the unified language of the Matrix.

Closed form is closely associated with the concept of latency. A latent state is a state of concealed presence. It has not yet manifested itself, but is already real as a possibility. The seed latently contains the plant. The bud latently contains the flower. The crystalline nucleus latently contains the future growth of the structure. Rock latently contains the line of a possible fault. A gas cloud latently contains the possibility of stellar concentration. A cultural sign latently contains a system of meanings. Latency demonstrates that the reality of form is not exhausted by its visibility.

For the hypothesis of the Unified Matrix of the Universe, this proposition is of fundamental importance. The Matrix as a morphogenetic model cannot be understood solely through completed, unfolded forms. Initial closed states must also be analysed—states in which form has not yet been visually presented, but has already been prepared internally. Otherwise, the hypothesis would describe only the result, not the beginning. Closed form allows the beginning to be seen not as an empty point, but as a rich structure from which unfolding commences.

In this respect, closed form constitutes the first stage of the morphogenetic process. In the A–B–C–D model, it corresponds to stage A: initial potential wholeness. This stage is not chaos. It is a state of integration. Future differences have not yet become separated within it, but the possibility of their separation is already present. At stage B, symmetry is broken and a direction appears. At stage C, differentiation, layers, branches and modules emerge. At stage D, the structure becomes manifest. All subsequent stages, however, are impossible without stage A as their concealed foundation.

Stage A is particularly difficult to analyse because its characteristics are often not immediately apparent. An open flower is easy to describe in terms of its centre, petals, radiality and edge. A leaf may be described through its axis, veins, network and surface. A river system may be described through its channels and tributaries. A nebula may be described through its shells, luminous zones and periphery. A closed form, however, does not yet display its complete structure. Its analysis therefore requires attention to potential characteristics: boundary, internal stress, compactness, concealed polarity, the capacity to unfold, relationships with the environment and threshold conditions.

A seed as stage A, for example, possesses a covering, compactness, an internal embryo, the capacity to germinate and a dependence on environmental conditions. A bud as stage A possesses concealed radiality, layering, a centre and future petals, although they remain closed. A crystalline nucleus possesses an initial order capable of expansion. A geological stress zone may contain the possibility of a crack even when no visible fracture exists. A cosmic concentration of matter may not yet possess a vivid form, but already determines future dynamics. Concealed structure must therefore be identified not only from external appearance, but also from processual possibility.

Closed form is also associated with the concept of stress. It may be outwardly still, yet internally under tension. A seed remains dormant, but under favourable conditions rapidly begins to grow. A bud appears motionless, but already contains the forces that will cause it to open. Rock may

retain stress for a long period until it becomes manifest as a fault. A volcanic system may accumulate pressure before an eruption. A gas cloud may be in a state of instability leading to condensation. Concealed structure is therefore often a structure of charged anticipation.

Such tension is not necessarily destructive. It may be generative if it results in organised unfolding. In biology, internal growth stresses open a bud or bring a shoot out of a seed. In geology, stress may create folds, faults and landforms. In the cosmos, gravitational instability may lead to the concentration of matter. In culture, the semantic tension of a symbol may unfold into a complex mythological or architectural system. Tension is therefore one of the mechanisms through which concealed structure becomes manifest form.

Tension must, however, be organised. Random destruction may eliminate a form without producing a new structure. If a seed is damaged in a way that prevents germination, its potential is lost. If rock crumbles chaotically, no morphogenetic pattern may emerge. If a symbol loses its context, it may become an empty decorative form. The transition from the concealed to the manifest therefore requires not merely the rupture of enclosure, but an organised disruption. This will be important in the following section on the transition from symmetry to asymmetry.

Closed form is also associated with internal polarity. Even if it appears outwardly symmetrical, distinctions of direction may already exist within it. A seed possesses a future root and a future shoot. An egg may possess polarity. A bud has a base and an apex. A crystalline nucleus may possess directions of future growth. A geological structure may contain oriented stresses. A cosmic cloud may possess an uneven distribution of density. This concealed polarity has not yet become a manifest axis, but prepares the way for its emergence.

In this sense, the axis does not arise from complete emptiness. It often manifests a concealed distinction that already existed. Seed germination makes the polarity between root and shoot visible. The opening of a bud reveals the radial organisation of the petals. A fault makes the direction of stress visible. A river channel reveals the gradient of the terrain. A cosmic shell reveals the direction of expansion or the distribution of matter. Manifest form is therefore often the unfolding of concealed structure.

This proposition has an important methodological consequence: to understand a form, one must study not only its final state, but also the conditions preceding its manifestation. A flower cannot be understood without the bud, a leaf without the leaf bud, a tree without the seed, a fault without stress, a landscape without its geological history, a nebula without its astrophysical dynamics, or a symbol without its cultural context. Closed form requires historical and processual analysis. It demonstrates that morphology is inseparable from genesis.

Closed form also helps to clarify the concept of internal order. Internal order is not always geometrically visible. It may be distributed, field-like, informational, material or compositional. In a living organism, for example, future form is determined not only by the arrangement of parts, but also by regulatory processes, signals, mechanical conditions, electrical potentials and cellular interactions. In stone, internal order may be associated with crystalline structure or the history of pressure. In a symbol, it may be associated with tradition and a system of meaning. Concealed structure therefore need not outwardly resemble the future form. It establishes the possibility of that form, not a completed copy of it.

This is especially important in relation to the Matrix. The Matrix cannot be imagined as a reduced model of a future object hidden within an initial form. A seed does not contain the mature tree as a miniature copy. A bud does not contain the open flower as a completed static figure. A

crystalline nucleus does not contain a large crystal as a small-scale model. Strictly understood, the Matrix is not a miniature of the result, but the structural logic of its possible unfolding. The closed form contains not a completed form, but the order of transition towards form.

This understanding protects the hypothesis from archaic or naïve preformationism. In the history of biological thought, there were conceptions according to which an organism already pre-existed in its entirety within the embryo in miniature form. The modern understanding of morphogenesis, and the logic of the present hypothesis, are different: form arises through development. Development is not arbitrary, however. It is directed by internal organisation, the environment and processes of self-organisation. The closed form is therefore neither a completed copy of the future nor an empty indeterminacy. It lies between these extremes.

In philosophical terms, closed form is a unity of possibility and constraint. Its possibility consists in its capacity to unfold. Its constraint consists in the fact that it cannot unfold in an arbitrary manner. A seed has a particular developmental range. A bud unfolds into a particular type of flower. A crystal grows in accordance with the structure of its substance. Rock fractures along lines of stress and weakness. A cosmic structure develops within physical conditions. A symbol reveals meanings within the bounds of a cultural tradition. Concealed structure therefore establishes not absolute freedom, but an organised field of possibilities.

This field of possibilities is a crucial concept for the hypothesis of the Matrix. The Matrix does not prescribe every detail, but constrains and directs development. It establishes types of transition that may be realised in different ways. From a centre, for example, there may arise an axis, radiality, a spiral or shell-like organisation. A layer may develop into multilayered organisation, folding or rupture. An edge may develop serration, undulation, petal-like organisation or scalloping. Branching may produce a network, a crown, a river basin or a system of cracks. Closed form contains the potential for such transitions, but their particular realisation depends upon the environment.

In this sense, concealed structure is always associated with future variability. It does not abolish diversity, but makes it possible within particular limits. Two seeds of the same species may produce plants of different forms. Two stones of the same rock type may possess different textures. Two river basins may possess different configurations. Two nebulae may possess different shells. Two cultural symbols of the same type may have different artistic realisations. In every case, however, a recurrent principle of organisation may be sought. Closed form establishes not uniformity, but affinity.

The visibility of concealed structure is a particularly important question. Sometimes it becomes visible only after unfolding. Until a seed has germinated, the future form of the plant cannot be seen in full. Until a bud has opened, the flower's radiality remains concealed. Until stress produces a fault, the line of rupture may remain invisible. Until a gas cloud changes state, its future structure may exist only potentially. Analysis of the Matrix therefore requires reconstruction: one must be able to discern traces of the concealed stage in the manifest form, and the possibility of unfolding in the concealed form.

Such analysis may proceed in two directions. The first runs from beginning to result: how does a closed form unfold into a structure? The second runs from result to beginning: which characteristics of an unfolded form point to its concealed initial state? An open flower, for example, allows the bud and seed to be reconstructed; a river network, the initial terrain and direction of drainage; a crack in stone, internal stress; a nebula, the dynamics of outflow or the

distribution of matter; and a symbol, the compositional centre and cultural intention. Both directions are important to the hypothesis.

Closed form is also associated with the shell. The shell is a particular expression of the boundary, but possesses a more active significance. It protects, retains, regulates and separates, and may sometimes nourish or determine form. The seed coat, eggshell, petals of a bud, cell membrane, tree bark, stone surface, mineral crust, cosmic shell of a nebula, architectural wall and circular frame of a symbol perform different functions, but are morphologically associated with the retention of internal order. The shell is the material boundary of concealed structure.

The shell may, however, also become an obstacle. Development requires it to change its function: from being protective, it must become capable of opening, becoming permeable, rupturing or being overcome. The seed coat must allow the shoot to emerge. The bud must open its petals. Bark may crack as a tree grows. A geological surface may rupture under pressure. A cosmic shell may expand and break apart. In culture, a closed symbol may unfold through interpretation. The shell is therefore not merely protective, but is also a future site of transition.

Within the hypothesis of the Matrix, this means that every closed form contains the possibility of an edge. While the form is closed, the boundary is a shell. When the form unfolds, the boundary becomes an active edge. This transformation of shell into edge is one of the key moments of morphogenesis. Through it, the closed structure becomes open, the internal emerges externally, symmetry is broken, and direction and periphery arise. Concealed structure does not disappear during unfolding, but is transformed into visible morphology.

Closed form also demonstrates the relationship between order and protection. In nature, many processes require a protected phase: the seed, egg, cocoon, leaf bud, flower bud, embryo, crystalline nucleus, enclosed cavity or geological inclusion. Protection allows the internal process to persist until it is ready to interact externally. This may be regarded as a universal morphogenetic principle: a complex form often requires a phase of concealed accumulation. An open structure without prior internal preparation would be unstable.

Protection, however, is not equivalent to isolation. A seed may remain dormant, but it is still part of its environment. It responds to humidity and temperature. A bud responds to seasonal changes. Within the limits of its biology, an egg exchanges matter and energy with the external environment. A geological structure undergoes pressure and temperature. A cosmic cloud interacts with its surroundings. A symbol lives within culture. Closed form is therefore always relative: it is closed in external appearance, but has not been removed from a system of relationships.

This allows the Matrix to be understood as open potentiality. The initial form is not absolutely autonomous. It contains internal order, but the realisation of that order depends upon external conditions. Concealed structure and environment must therefore be considered together. Internal potential without an environment remains unexpressed. An environment without internal potential does not produce this particular form. Morphogenesis arises through their interaction. This proposition will be important to all subsequent chapters, in which biological, geological, cosmic, and cultural forms will be analysed as results of the interaction between internal organisation and external conditions.

Closed form also possesses aesthetic and symbolic significance. Human beings often perceive closed forms—the seed, egg, circle, sphere, bud, droplet and stone—as images of mystery, beginning, emergence, protection and fullness. This perception has cultural foundations, but it is

not arbitrary. Morphologically, such forms genuinely express integration and potential. They do not yet reveal their full contents, but promise them. Within culture, this becomes the symbolism of birth, the cosmos, the world egg, the grain, the centre, concealed knowledge and sacred fullness. Within the hypothesis of the Matrix, this symbolic level may be employed cautiously as hermeneutic support for the morphological significance of closed form.

Cultural symbolism must not, however, replace analysis. If a circle or egg signifies the world in a myth, this does not prove the natural universality of the Matrix. It does, however, demonstrate that a closed potential form has long been perceived by human beings as a powerful image of a beginning. Such perception may be incorporated into the philosophical level of the hypothesis. The scientific level must be grounded in morphogenesis, self-organisation, biology, geology, cosmology and the analysis of form. The symbolic level demonstrates how these forms acquire meaning within culture.

The relationship between closed form, light and visibility is of particular significance. While structure remains concealed, it is not fully accessible to the eye. Unfolding makes it visible. This has not only optical, but also philosophical significance. Morphogenesis is a process of manifestation. Concealed order becomes visible form. The internal emerges externally. Potential becomes structure. The entire hypothesis of the Matrix may therefore be understood as an investigation of the transition from concealed order to visible morphology. Closed form is the starting point of that transition.

In the biological example, this transition is especially expressive: a seed germinates, a bud opens, a leaf unfurls and a flower becomes visible. In geology, concealed stresses manifest themselves in folds, faults, cracks and relief. In the cosmos, invisible processes become accessible through light, radiation, images and models. In culture, concealed meaning unfolds through symbol, text, ritual and interpretation. The same morphological logic is present throughout: the concealed becomes manifest through form.

Thus, within the hypothesis of the Unified Matrix of the Universe, closed form is not a static figure, but the initial phase of morphogenesis. It contains concealed structure, internal order, the potential for unfolding, a boundary, a shell, polarity, tension and dependence upon environmental conditions. Its enclosure does not imply emptiness. On the contrary, it is a means of preserving the future form until the moment of its manifestation. The seed, bud, egg, crystalline nucleus, geological stress zone, cosmic condensation and symbolic circle may be regarded as different levels of this morphological situation.

The beginning of form is therefore not unstructured. Initial wholeness is charged with possibility. It may be outwardly simple but internally complex; symmetrical but latently polar; closed but ready to unfold; stable but capable of losing equilibrium. The next step in the hypothesis is therefore concerned with the transition from symmetry to asymmetry. Development begins when the closed form ceases to be merely an enclosed whole and enters a phase of organised unfolding.

6.4. The Transition from Symmetry to Asymmetry

The transition from symmetry to asymmetry is one of the central moments in the hypothesis of the Unified Matrix of the Universe. In the preceding sections, the circle-seed was considered as

an initial structure: closed, potential and internal, not yet unfolded into a complex form. Such a state is not in itself development. It is preparation for development. For morphogenesis to begin, the initial whole must leave equilibrium. The closed structure must break its original symmetry and enter a phase of unfolding.

In this context, symmetry signifies more than geometrical regularity. It denotes a state in which directions are relatively equivalent, the form is integrated, internal equilibrium prevails and the structure is enclosed. The circle is the clearest model of such symmetry: all directions from the centre to the boundary are equally possible, and none has yet been distinguished as principal. The seed likewise expresses this state: the future form is concealed and does not yet possess a visible axis of growth, branching, leaves, a flower or a periphery. Initial symmetry is a state of potential fullness, but not of unfolded structure.

Development begins when this equivalence is disrupted. One direction becomes primary. One region of the boundary becomes a site of emergence. One internal polarity becomes visible. One zone becomes more active than another. Asymmetry thus arises. Here, however, asymmetry should not be understood as the chaotic destruction of form. In the morphogenetic sense, asymmetry is the beginning of organisation. It distinguishes a direction, creates an axis, opens the possibility of differentiation and transforms concealed order into a visible process.

Symmetry breaking is therefore not a negation of the Matrix, but a condition of its unfolding. If the circle-seed remains closed for ever, form does not emerge. If the seed does not germinate, the plant does not arise. If the bud does not open, the flower does not become visible. If internal stress within rock does not find expression, no fold or crack is formed. If a cloud of matter does not undergo instability, no new cosmic structure arises. In all these cases, development requires a departure from the initial equilibrium.

This transition is particularly evident in the biological example. Before germination, the seed retains a closed form. When the necessary conditions arise, however, it begins to change. The covering swells, internal processes are activated, and the first radicle and then the shoot emerge. From this moment onwards, the initial symmetry has been broken. The seed is no longer merely a compact body. Directions have become differentiated within it: downwards and upwards, root and shoot, internal structure and external space, the concealed and the manifest. This first asymmetry becomes the beginning of the plant.

A closely related process occurs in the bud. Before opening, it retains its integration and relative symmetry. The petals are concealed, the centre is closed, and the periphery has not yet manifested itself. At the moment of unfolding, however, the layers begin to separate, the centre becomes visible, the petals assume different positions, the edge becomes active, and radiality passes from a concealed state into a manifest one. The bud ceases to be a closed body and becomes a flower. Here, symmetry breaking does not destroy form, but reveals it.

A leaf may also be considered through this logic. A young leaf is often rolled or folded. Its future plane has not yet unfolded. When unfurling begins, an active asymmetry arises: the central vein establishes an axis, the lateral veins distribute direction, the margin acquires a complex contour, and the surface begins to interact with light and air. The initial concealed structure becomes visible through the disruption of compactness. The unfolded leaf is the result of a transition from enclosure to a directed, networked and peripherally complex form.

At the embryonic level, the transition from symmetry to asymmetry has an even more profound significance. Early developmental stages may appear relatively homogeneous, but body axes,

polarity, layers and regions of future differentiation subsequently arise within the system. Distinctions emerge between anterior and posterior, upper and lower, internal and external, and left and right. These differences are not accidental. They create the spatial map of the future organism. Asymmetry therefore acts as a condition of complex organisation.

In this respect, morphogenesis may be defined as a controlled, organised and stabilised breaking of initial symmetry. Complete symmetry corresponds to potentiality. Complete chaos corresponds to disintegration. Development lies between the two. It breaks symmetry without destroying order. It introduces difference while preserving wholeness. It creates directionality without severing the connection between parts. Asymmetry within the Matrix is therefore not a defect, but a mode of becoming.

In geology, the transition from symmetry to asymmetry is manifested differently. Rock may remain relatively intact until internal stresses reach a threshold. A fold, crack, fault, displacement or wave of deformation then arises. The previous homogeneity is disrupted. This disruption, however, is not always merely destructive. It may create a new geological form: folded relief, a fault line, a network of cracks, a mountain structure or the channel of a future flow. In geology, asymmetry frequently arises through pressure, compression, tension, rupture and the redistribution of matter.

The crack Is particularly expressive. Before it appears, internal stress may remain concealed. The surface appears intact. When the stress crosses a threshold, however, a line of rupture emerges. This line breaks the material's previous symmetry. It creates direction, an edge, separation and sometimes branching. A crack may be destructive, but it also makes the concealed structure of stresses visible. Morphologically, therefore, the crack is a moment of transition from concealed order to manifest asymmetry.

A river network likewise forms through the disruption of surface uniformity. If a surface were completely homogeneous and possessed no gradients, flow would not acquire a stable direction. Real terrain, however, always contains differences: variations in elevation, depressions, differences in rock density, obstacles and areas of resistance. Water selects directions, reinforces them, deepens channels and creates tributaries. A relatively less articulated surface thus develops into an asymmetrical branching system. A river network is a form in which the disturbance of surface equilibrium becomes a stable order of drainage.

In cosmic structures, the transition from symmetry to asymmetry is associated with instabilities in the distribution of matter. If matter were distributed with complete uniformity, condensations, stars, clouds, galaxies, shells and spiral structures would not arise. Cosmic form generation requires differences in density, motion, rotation, gravitational concentration and the interaction of radiation with matter. Small inhomogeneities may be amplified and become the basis of large structures. In this sense, the cosmos likewise demonstrates that form arises where homogeneity is disrupted.

A nebula, for example, may possess a centre, shells, ruptures, filaments, regions of condensation and a complex periphery. All these are traces of dynamic processes: outflows, expansion, shock waves, gravity, magnetic fields and turbulence. Symmetry here is often incomplete. A cosmic form may be radial but not perfectly uniform, shell-like but ruptured, spiral but asymmetrical, centred but displaced. It is precisely this incomplete symmetry that makes it a real natural form rather than an abstract figure.

A galactic spiral likewise demonstrates organised asymmetry. A spiral is not a circle, although it retains a connection with the centre. It breaks the closed circumference by transforming it into movement. Each turn is connected with the preceding one, but does not coincide with it. The spiral combines repetition and difference, the centre and movement away from the centre, rotation and development. It may therefore be regarded as one of the most expressive forms of the transition from symmetry to dynamic asymmetry.

In cultural systems, this transition acquires symbolic expression. The circle may be the initial sign of wholeness. Yet many sacred and artistic compositions do not remain simple circles. A centre, axis, cross, star, triangle, spiral, rosette, mandala, tiers, ornament or radial lines appear within them. Cultural form appears to disrupt pure circular enclosure in order to make internal order visible. This symmetry breaking may be strictly organised and symbolically rich. It transforms an empty circumference into a structure of meaning.

The Shri Yantra, mandala, rose window, World Tree, circular ornament and architectural plan demonstrate that culture often constructs complexity through the differentiation of centre and periphery. A complete space is first established; directions, levels, intersections, repetitions, axes and boundaries are then differentiated within it. Symbolic form thus reproduces a general morphogenetic logic: initial wholeness becomes an unfolded structure through organised difference.

It must be emphasised that asymmetry does not abolish symmetry completely. Symmetry and asymmetry coexist in many natural and cultural forms. A flower may possess an overall radial order, while its individual petals differ. A leaf may have a central axis, while its venation and edge vary. A tree may possess a general principle of branching, while its crown is asymmetrical. A river network follows a drainage hierarchy, while its configuration is unique. A nebula may possess a centre and shell, while its edges are irregular. An architectural composition may be symmetrical in plan, yet rich in detail and deviation.

This combination of symmetry and asymmetry is a fundamental property of living and natural form. Absolute symmetry is often static. Absolute asymmetry may be chaotic. Real form exists between them. It preserves a recognisable order while allowing variation. This is why natural forms appear both regular and individual. In this sense, the Matrix is not a schema of ideal symmetry. It is the logic of transition from symmetry to organised variability.

Within the hypothesis of the Unified Matrix of the Universe, this transition may be described as movement from the circle to the axis. The circle expresses uniform wholeness. The axis expresses a distinguished direction. As long as there is only a circle, the form remains integrated. When the axis appears, unfolding begins. The axis may be vertical, horizontal, radial, spiral, fault-related, growth-related, compositional or symbolic. In every case, however, it signifies that the space of form is no longer completely equivalent in every direction. It has acquired orientation.

The emergence of an axis is the first act of asymmetry. Even if the axis subsequently organises a symmetrical structure, its differentiation has already disturbed the initial equilibrium. In the seed, the root–shoot axis establishes polarity. In the leaf, the central vein establishes direction. In the tree, the trunk establishes the vertical. In geology, the line of a fold or fault establishes directionality. In architecture, an axis organises movement and the perception of space. In symbolism, the world axis connects different levels. In every case, the axis transforms potential wholeness into a developing structure.

The formation of layers and branches is the next stage. Following the emergence of the axis, form begins to differentiate. Shells, layers, lateral directions, branches, radial elements and modules may arise around the axis. The concealed layers of petals unfold within a bud. Lateral veins branch from the central vein of a leaf. Branches extend from the trunk of a tree. In a river system, tributaries branch from the main channel or, conversely, converge to form the main river. In a symbolic composition, rays, tiers and ornamental repetitions radiate from the centre. Asymmetry here becomes a source of multiplicity.

The active edge is of particular significance. When initial symmetry is broken and form unfolds, its boundary ceases to be a simple circumference. It becomes more complex. The edge becomes serrated, undulating, petal-like, ruptured, branching, scalloped or layered. This can be observed in leaves, flowers, cracks, coastlines, clouds, nebulae and ornaments. The active edge demonstrates that development has reached the periphery and entered into interaction with the environment. The circle's initial boundary has become a complex morphological zone.

The transition from symmetry to asymmetry may therefore be understood as the transformation of boundary into edge, centre into axis, potential into process, and concealed structure into manifest form. This is not a momentary act, but a sequence. Initially, the system is in a closed state. An instability or threshold then arises. A direction is subsequently distinguished. Differentiation follows. The form then develops a more complex periphery and stabilises as a new structure. In the A–B–C–D model, this process corresponds to the transition from stage A to stage B and subsequently to stage C.

Stage A is the circle-seed: potential wholeness, concealed structure and relative symmetry. Stage B is the first act of asymmetry: the emergence of an axis, shoot, crack, direction, polarity or centre of activity. Stage C is the development of asymmetry into structure: layers, branches, petals, veins, folds, waves and secondary elements. Stage D is the stabilisation of the unfolded form: flower, leaf, relief, network, nebula or symbolic composition. Symmetry breaking is therefore not an incidental detail, but the mechanism of transition between the stages of the Matrix.

This mechanism must, however, be understood rigorously. Symmetry breaking does not mean that form becomes arbitrary. On the contrary, it is organised asymmetry that enables form to become more complex. In biology, asymmetry is regulated by developmental processes. In geology, it is directed by the distribution of stresses and the properties of the material. In the cosmos, it is governed by physical laws, gravity, rotation and the dynamics of matter. In culture, it is governed by compositional rules and symbolic meaning. Asymmetry therefore possesses its own discipline. It does not destroy order, but transforms it.

In this sense, we may speak of morphogenetic asymmetry. This is not a random deviation from regularity, but a productive difference that creates form. Morphogenetic asymmetry distinguishes a direction, determines the future structure, initiates differentiation and creates the conditions for branching, layering, spirality and self-similarity. It is the driving moment of the Matrix. Without it, the Matrix would remain merely a potential circumference and would never become an unfolded form.

The transition from symmetry to asymmetry also explains why real natural forms do not coincide with ideal geometrical models. A perfect circumference, perfect radiality and a perfect spiral are abstractions. Real form always develops through an environment, resistance, contingent conditions, inhomogeneities, constraints and history. It therefore inevitably contains

asymmetries. These asymmetries, however, are not simply errors. They are traces of actual becoming. Form becomes individual precisely because it develops under specific conditions.

This proposition is especially important to image analysis. When biological, geological and cosmic forms are compared, no absolute correspondence should be expected. A flower will not be perfectly symmetrical, a stone will not form an exact circle, a nebula will not be a perfect mandala, and a river network will not be a regular tree. If, however, they preserve structural characteristics of the transition from centre to axis, from axis to branching, from layer to periphery, and from enclosure to unfolding, they may be included in an analysis of the Matrix. The principal object of investigation is not perfection, but organised variability.

Asymmetry is also associated with individuality. Symmetry expresses type; asymmetry, its particular embodiment. All the leaves of a species may possess a common plan, yet each leaf is individual. All flowers may preserve a morphological type, yet each unfolds in a slightly different way. All river networks obey the laws of drainage, yet each possesses a unique pattern. All nebulae are governed by physical processes, yet each has its own configuration. Asymmetry is therefore not a deficiency of form, but its biography.

It may be said that the Matrix establishes a typological order, while asymmetry produces its individual realisation. Centre, axis, layers, branching, edge and self-similarity are general characteristics. Their particular combination, degree of expression, direction, deformation, rupture, displacement, variability and scale, however, produce a unique form. The hypothesis of the Unified Matrix of the Universe must therefore describe not only universal invariants, but also the ways in which they are individually manifested.

The transition from symmetry to asymmetry is also related to the problem of time. A symmetrical closed form is often perceived as a state of rest. Asymmetry introduces time because it indicates a process: something has begun to move, grow, unfold, fracture, propagate, rotate or disperse. An axis indicates the direction of development. A crack indicates an event of stress. Branching indicates a sequence of growth or distribution. An edge indicates interaction. Asymmetry therefore makes time visible in form.

In the seed, time is concealed as the future. In the shoot, it becomes manifest. In the bud, time is concealed as an awaiting of unfolding. In the flower, it becomes manifest as an unfolded stage. In stone, time is concealed in layers and stresses. In a crack, it manifests itself as an event of rupture. In a nebula, time is manifested through shells, expansion, ruptures and luminous structures. In a symbol, time is manifested through repetition, cycle, ritual and interpretation. Asymmetry thus translates concealed temporality into visible morphology.

The relationship between asymmetry and the spiral is especially important. The spiral is a form that is no longer a circle, yet retains the memory of the circle. It breaks the closed circumference, transforming it into unfolding. The spiral possesses a centre, rotation, repetition and movement away from the initial point. It is an image of development in which return is combined with change. The spiral may therefore be regarded as one of the most developed forms of transition from symmetry to dynamic asymmetry.

In biology, the spiral may be manifested in the arrangement of leaves, seeds, inflorescences, shells and certain growth structures. In geology and hydrodynamics, it may appear in vortices, cyclones, flows, folds and twisted forms. In the cosmos, it appears in galactic structures and certain formations of gas and dust. In culture, it appears in ornament, sacred signs and symbols of time and development. In every case, the spiral arises through different mechanisms, but its

morphological function is similar: it demonstrates how circular wholeness passes into directed movement.

The transition from symmetry to asymmetry is also associated with fractality. As soon as form begins to branch, develop layers, increase the complexity of its edge or reproduce its structure within its parts, initial symmetry gives way to self-similar complexity. A fractal structure is almost never perfectly symmetrical. It reproduces a principle, but with variations. Fractality is therefore not merely repetition, but repetition with asymmetrical difference. A branch resembles a tree, but is not identical to it. A tributary resembles a river, but follows its own course. A small fault resembles a large one, but differs in its particular form. In this way, the Matrix becomes not a mechanical symmetry, but a living hierarchy of differences.

At the cultural and philosophical level, the transition from symmetry to asymmetry may be regarded as a transition from unity to a world of differences. Initial wholeness is integrated, but has not yet manifested itself. Development produces multiplicity. This multiplicity may be chaotic if its connection with the centre is lost. If the connection is preserved, however, a cosmos of form—an ordered diversity—arises. This is precisely what the Matrix expresses: neither simple unity nor simple chaos, but the unfolding of unity into diversity.

This approach is important to an understanding of the hypothesis's universality. The universality of the Matrix does not mean that all forms return to a single ideal symmetry. On the contrary, it means that different forms may follow a similar path: initial wholeness, symmetry breaking, the emergence of direction, differentiation, the complexification of the periphery, stabilisation and a new cycle. Every form follows this path in its own way. Universality is therefore manifested through asymmetrical variants rather than identical copies.

The transition from symmetry to asymmetry also helps to explain the role of error, deviation and chance. During the development of form, random fluctuations may be suppressed or amplified. A small deviation may become the beginning of a new structure. In reaction–diffusion models, a minor inhomogeneity may produce a pattern. In biological growth, a local difference may become a developmental zone. In geology, a material weakness may become a fault line. In the cosmos, a small condensation may become a centre of further concentration. This demonstrates that asymmetry may begin with a small difference and subsequently become structure-forming.

Not every deviation, however, is productive. Some disruptions destroy a system. Some fluctuations disappear. Some cracks do not develop. Some growth processes cease. Morphogenesis therefore requires not just any breaking of symmetry, but one that is incorporated into a system of organisation and becomes stabilised. This distinction is important to the hypothesis: the Matrix should not interpret every instance of disintegration as development. Development begins where a disturbance of equilibrium produces a new order.

The transition from symmetry to asymmetry consequently has a criterion of success: the resulting asymmetry must create a stable structure or open a path to further differentiation. A shoot must become a plant. The opening of a bud must produce a flower. A crack must become a fault structure or a new edge. A flow must become a channel. A cosmic inhomogeneity must become a region in which matter is organised. A symbolic distinction must become a composition. If this does not occur, the asymmetry remains a chance disruption rather than a morphogenetic event.

This criterion is especially important within the Matrix hypothesis when analysing images and objects. Not every irregularity may be declared a manifestation of the Matrix. It is necessary to determine whether it forms part of the overall organisation of the form. Is it part of an axis,

branching pattern, layer, edge, radial organisation, spiral or self-similarity? Is it connected with a process of development? Does it stabilise within the structure? If so, it may be morphogenetically significant. If not, it may be an accidental deformation or noise.

Asymmetry within the hypothesis of the Unified Matrix of the Universe thus possesses several levels:

- first is initial asymmetry, in which a direction becomes differentiated from a closed form;
- second is structural asymmetry, in which layers, branches, edges and modules arise;
- third is functional asymmetry, in which different parts acquire different roles;
- fourth is historical asymmetry, in which form preserves traces of its individual development;
- fifth is fractal asymmetry, in which the principle is reproduced within parts with variations.

All these levels are important to an understanding of real form.

Development therefore begins not with the abandonment of order, but with its transformation. The initial symmetry of the circle-seed is necessary but insufficient. It must be broken if form is to become visible, directed, multilayered, branching, peripherally complex and capable of reproduction. Asymmetry is not an error in the Matrix, but its driving mechanism. Through it, concealed structure becomes manifest form.

The circle-seed as the initial structure thus fulfils its significance precisely at the moment of transition. It is not intended to remain closed for ever. Its purpose is to prepare unfolding. The seed must germinate, the bud must open, the circle must give rise to an axis, the shell must become an active edge, and symmetry must pass into organised asymmetry. The morphogenesis of the Matrix begins properly in this transition. The next chapter must therefore address the unfolding of form: the manner in which the axis, leaf-like structure, layers, branching and peripheral complexity arise from the initial circle-seed.

Chapter Seven

Leaf-like Unfolding as a Model of Development

7.1. The Leaf as a Universal Form of Unfolding

Having considered the circle-seed as the initial structure, we must proceed to the next stage of the hypothesis of the Unified Matrix of the Universe—the unfolding of form. If the circle-seed expresses potentiality, enclosure, internal order and initial wholeness, the leaf-like form expresses unfolding, directionality, distribution, periphery and the active edge. In this chapter, the leaf is considered not only as a botanical object, but as a universal morphological model of an unfolded plane in which the axis, veins, layers, facets, edges, rhythm of growth and interaction between form and environment become visible.

Such an extended understanding of the leaf requires caution. It is not being suggested that all natural forms are leaves or that geological, cosmic and cultural structures literally possess a botanical nature. The leaf is used here as a model because the logic of unfolded form is manifested in it with particular clarity. It possesses a central axis, a system of branches, a surface, an edge, an internal network, a connection with growth, a function of exchange and a capacity to exhibit fractal self-similarity. The leaf may therefore serve not as an object of identification, but as a morphological key to understanding an unfolded structure.

The leaf begins with an axis. In most leaf forms, the central vein or principal line establishes the direction around which the entire surface is organised. This axis connects the base of the leaf with its apex, the internal with the external, and the point of attachment with the periphery. Lateral veins branch from it, distributing nutrients and water, providing mechanical support and establishing structural order. In morphological terms, the central vein continues the first act of asymmetry described in the preceding chapter: the circle-seed breaks its enclosure and differentiates a direction, which becomes the axis of the future form.

The leaf axis demonstrates that unfolding is not a chaotic expansion. Form does not merely spread in all directions. It is organised around a principal direction. Even if a leaf has a complex edge, asymmetrical lobes, an undulating surface or an irregular contour, its internal structure frequently remains connected with an axial logic. The leaf is therefore an example of how morphogenesis combines directionality and variability. A general order exists, but so too does its particular individual realisation.

Veins radiate from the leaf's central axis. It is precisely these that make the leaf an especially important model for the hypothesis of the Matrix. The veins demonstrate the transition from the one to the many. The principal line gives rise to lateral lines; the lateral lines may give rise to smaller ones; and the smaller lines form a network. The leaf surface consequently becomes not a homogeneous plane, but a distributed system. It reveals how a single structural principle is repeated at several levels: axis, branch, network, micronetwork and edge. This makes the leaf a natural model of fractal unfolding.

Leaf venation also demonstrates the functional aspect of form. It is not a decorative pattern. The veins support the tissue, distribute water and other substances, connect the base of the leaf with its periphery and provide stability to the surface. Form is therefore inseparable from function. The leaf has its particular appearance not merely because it possesses a particular contour, but because its internal network performs the tasks of distribution, nourishment, support and exchange with the environment. In this sense, the leaf demonstrates that the morphological beauty of a natural form is often the visible aspect of its functional organisation.

This proposition is fundamental to the hypothesis of the Unified Matrix of the Universe. The Matrix should not be understood as pure geometry. If form recurs in different systems, it often does so because different systems encounter similar structural problems: distributing a flow, connecting centre and periphery, increasing surface area, maintaining an edge and enabling a transition from a principal axis to a multitude of local directions. The leaf is one of the clearest models of such a solution. It demonstrates how a structure may simultaneously be economical, complex and functional.

Leaf-like unfolding may be defined as a transition from a compact, concealed or axial state to an unfolded planar or quasi-planar form in which internal organisation becomes visible through a network of lines, layers, segments and active edges. This definition allows the leaf to be used as a model beyond the plant kingdom. In geology, leaf-like forms may be manifested in strata, folds, fracture networks, mineral veins, thin layers of stone and unfolded relief surfaces. At the morphological level, and with appropriate caution, cosmic examples may include shells of gas and dust, filamentary structures, extended fronts of matter, nebular edges and cloud-like planes. In culture, leaf-like unfolding may be manifested in ornament, architectural surfaces, façades, bas-reliefs, wings, rosettes, tree-like compositions and symbolic planes.

The leaf is also important because it combines the linear and the planar. A stem or shoot is primarily axial. It establishes direction. The leaf unfolds this direction into a surface. This represents a new stage of morphogenesis. The axis ceases to be merely a line and becomes the organising principle of a plane. Secondary directions radiate from it, tissue arises between them, the surface acquires form and the edge becomes complex. Within this logic, the leaf is the next step after the seed and axis: the seed contains potential, the shoot establishes direction and the leaf unfolds space.

The leaf plane is not a simple geometrical plane. It is living, stressed and structured, and is frequently curved, undulating, folded or segmented. It may be entire, dissected, lobed, serrated, needle-like, pinnate, fan-shaped, rounded, elongated or asymmetrical. Yet despite this diversity of leaf forms, a general morphological principle remains: the unfolded surface is organised through an internal network and a peripheral edge. It is this principle that makes the leaf a universal model rather than a particular botanical example.

Of particular importance is the leaf's demonstration of the relationship between centre, axis and edge. In the circle-seed, the edge was the simple boundary of a closed form. In the leaf, the edge becomes an active periphery. It no longer merely separates the internal from the external, but participates in the formation of the entire structure. The leaf margin may be smooth, serrated, undulating, lobed, dissected, folded or irregular. Its form reflects growth, tissue stresses, interaction with the external environment, organisation characteristic of the species and the individual conditions of development. The leaf margin is therefore one of the principal sites at which the Matrix becomes visible.

Within the hypothesis of the Matrix, the edge possesses a particular meaning. The centre and axis establish internal order, but it is the edge that demonstrates how this order encounters the external world. The leaf margin interacts with light, air, moisture, temperature, mechanical forces, damage and growth processes. It records not only the internal programme of development, but also external conditions. The edge is therefore a zone of dialogue between structure and environment. This makes it an active morphogenetic boundary rather than a passive termination of form.

The leaf also demonstrates that an unfolded form need not be uniform. Veins are not distributed with absolute symmetry, the edge may display deviations, the surface may curve, and individual areas may grow faster or more slowly. This variability does not destroy the leaf as a form. On the contrary, it makes it real. The leaf preserves typological order while manifesting individuality. In this sense, it is an excellent example of organised asymmetry: the form is recognisable, but not mechanically reproducible.

Leaf-like unfolding is closely associated with fractality. A leaf frequently exhibits repetition of structure at different levels: the principal vein, lateral veins, minor veins, reticulate distribution and the small-scale contours of the margin. Each level does not reproduce the preceding one literally, but repeats the principle of directed distribution. This corresponds to the broader logic of the Matrix: the part carries a trace of the whole, while the whole is manifested through a hierarchy of self-similar elements. The leaf does not merely possess fractal characteristics; it demonstrates how fractality arises through the process of growth.

The natural fractality of the leaf is nevertheless finite and variable. A leaf is not a strict mathematical fractal. Its self-similarity is limited by its tissue, function, size, species, environmental conditions and developmental history. It is precisely this, however, that makes the leaf particularly important to the hypothesis. The Matrix is not manifested as an ideal infinite geometry. It appears as the natural recurrence of a principle within the limits of a particular form. The leaf demonstrates such recurrence in a living, material, finite and functional form.

Leaf structure also helps to explain the concept of the layer. Outwardly, a leaf appears to be a thin surface, but in reality it possesses internal layering: tissues, veins, upper and lower surfaces, zones of density and surfaces of exchange. Even as a morphological model, the leaf is not an empty plane. It possesses thickness, internal organisation, directionality and different levels of organisation. This is important to the following section, in which layer, facet and edge will be considered as independent elements in the unfolding of form.

A layer within a leaf-like form may be manifested not only as physical thickness, but also as a level of organisation. The principal vein constitutes one level. The lateral veins form another. The fine network forms a third. The surface between the veins forms a fourth. The edge forms a fifth. Complex leaves add leaflets, segments, lobes and folds. This organisation into levels demonstrates that the development of form does not proceed as a solid mass, but through successive hierarchical articulation. The leaf is not merely an unfolded surface, but a system of levels.

The concept of the facet may likewise be associated with the leaf model. A facet is a face, region, segment, plane or surface element that participates in the general structure while possessing its own orientation and boundary. In a leaf, the areas between veins, lobes, segments and small planes of the surface may provisionally be described as facets that together constitute the whole. In geology, facet-like organisation may appear in crystal faces, fractured blocks, folded surfaces and layered fragments. In culture, it may occur in ornamental segments, architectural planes and

elements of bas-relief. Leaf-like unfolding makes it possible to discern how a whole form is composed of connected yet distinguishable regions.

The association of the leaf with respiration and exchange is of particular significance. In biological terms, the leaf is an organ of photosynthesis, gaseous exchange, transpiration and connection between the plant and its external environment. Morphologically, this means that an unfolded form exists for the purpose of interaction. It does not remain enclosed within itself, but increases the area of contact. The leaf unfolds in order to receive light, exchange substances and participate in the life process. The leaf-like model therefore presents development as an emergence into the environment. Form unfolds not merely to become visible, but to facilitate exchange.

This proposition may be extended to a more general level. Many natural forms unfold in ways that increase the surface area of interaction. Branching increases contact with space. Folding increases surface area. An undulating edge extends the boundary. Porosity increases the internal surface. The leaf is one of the clearest biological expressions of this principle. Within the hypothesis of the Matrix, the unfolding of form may be understood as an increase in organised contact between internal potential and the external environment.

The leaf also demonstrates the relationship between plane and volume. It may be thin, but is not devoid of three-dimensionality. Its surface may curve, roll, fold, turn towards the light and change position. A leaf-like form is therefore not flat in an abstract sense. It is an unfolded but dynamic surface. In this respect, the leaf may be regarded as an intermediate model between line and body: it is more than an axis, but not yet an enclosed volume; it unfolds space while preserving a slender connection with the initial line of growth.

This intermediate status makes the leaf especially important to an understanding of the Matrix. The circle-seed is compact wholeness. The axis is linear direction. The leaf is an unfolded surface. The flower is a radial, modular structure. The fruit is a new closed form. Within this sequence, the leaf occupies the stage of unfolding: it demonstrates how an internal axis becomes spatial organisation. Leaf-like unfolding is therefore not merely a particular stage in the development of a plant, but a general model of the transition from internal structure to external surface.

The leaf is also associated with the concept of a ‘visible map’ of internal order. Leaf veins are visible as a pattern, but this pattern is not decorative; it is a map of distribution. It reveals how internal organisation extends across the surface. In this sense, the leaf may be read as a morphological text. The principal line, lateral branches, network, segments and edge are all elements in the structural script of form. The leaf makes visible that which was concealed within the seed. This is why it constitutes a natural continuation of the themes of closed form and concealed structure.

If the seed conceals the future form, the leaf demonstrates its first broad emergence into the external world. It does not complete the entire life cycle, but it already demonstrates the principle of unfolding. It reveals how the centre and axis become a surface, how internal order becomes a network, how the boundary becomes an active edge and how a potential structure becomes visible. Within the hypothesis of the Matrix, the leaf should therefore be regarded as one of the principal models of manifest form.

Leaf-like unfolding may also be compared with geological surfaces. A rock stratum, for example, may be exposed as a layered plane in which veins, cracks and mineral lines resemble a distribution network. A relief surface may possess principal and secondary drainage lines, ridges,

valleys, edges and facets. Stone textures may exhibit layered, vein-like, undulating and branching structures. There is no biological leaf here, but there is an unfolded surface on which an axis, network, segments and edge are visible. This makes it possible to speak of leaf-like organisation as a morphological type rather than a botanical identity.

Leaf-like organisation must be applied even more cautiously to cosmic material. A nebula or gas cloud is not a leaf and possesses neither tissue, veins nor photosynthesis. Certain cosmic structures may, however, exhibit extended shells, filamentary networks, edges, fronts, layers and regions of distribution. Where such characteristics are present, they may be analysed through the language of leaf-like unfolding—not as a biological analogy, but as a morphological model of an unfolded surface or shell. Here, it is especially important not to proceed from a similarity of image to an assertion that the phenomena are identical in nature.

Leaf-like unfolding appears differently again in cultural forms. The ornamental leaf, wing, fan, rosette, bas-relief plane, architectural façade, page, scroll and mandala with radial or segmented unfolding may all reproduce the principle of an unfolded structure. Culture frequently employs the leaf as a symbol of growth, life, respiration, abundance, unfolding and connection with nature. Within the hypothesis of the Matrix, however, it is not only the symbolic meaning of the leaf that matters, but its structural function: it demonstrates how a whole unfolds into a plane with an axis, network, segments and edge.

The leaf also constitutes an important model of the relationship between centre and distribution. In a circular form, the centre may be clearly expressed, but distribution has not yet unfolded. In the leaf, the centre is often displaced towards the base or expressed as a principal axis. This demonstrates that an unfolded form may be organised not only around a geometrical centre, but around a functional direction. In the leaf, the centre becomes a line. This is an important transformation: point-like or compact centred organisation becomes axial organisation. The Matrix thereby demonstrates the flexibility of its elements.

In this sense, the leaf is a model not of radial, but of axial–peripheral form. The flower unfolds radially around a centre. The leaf unfolds along an axis and towards its edges. Both types are important to the Matrix, but they are distinct. The radial model demonstrates propagation from the centre in every direction. The leaf-like model demonstrates propagation from the base and axis towards the lateral peripheries. The leaf therefore complements the circle and the flower by introducing the concept of a directed, unfolded plane.

The leaf also helps to demonstrate that the periphery may be elongated, segmented and articulated rather than circular. In the circle, the periphery is uniform. In the leaf, it is governed by the axis and by growth. One edge may differ from the other, the apex may be more pronounced than the base, and the two sides may display different rhythms. This demonstrates that after the transition from symmetry to asymmetry, the boundary of form becomes historical. It bears the trace of the direction of growth, internal stresses, external conditions and the individual trajectory of development.

An important aspect of the leaf is its capacity to roll up and unfurl. Young leaves are frequently rolled or folded before opening. This makes the leaf a direct model of the transition from the concealed to the manifest. Folding, rolled organisation, unfurling, unfolding and the extension of the surface are all elements of leaf morphology. A chapter on leaf-like unfolding must therefore naturally proceed to the subject of the fold. Form does not appear from nothing; it unfolds from a state in which its future plane was gathered, compressed or folded.

The leaf fold possesses considerable philosophical significance. It demonstrates that form may be present but not unfolded; partially, but not fully, visible; internally organised but spatially compressed. When the leaf unfurls, a new form is not created from emptiness; what had been prepared within the fold becomes manifest. This manifestation, however, is not simply the mechanical unfolding of a finished pattern: growth, tissue, light, water, mechanics and environment participate in the final appearance. The leaf therefore combines the concealed, the processual and the manifest.

The leaf is also a model of the relationship between life and surface. Life requires surfaces of exchange. Cell membranes, tissues, lungs, vessels, roots and leaves all increase the area of contact. In this sense, leaf-like unfolding possesses a broader significance: it demonstrates that a complex system frequently develops by increasing its organised surface. The surface becomes not an external shell, but an active organ of interaction. This proposition may also be applied within a broader morphological analysis of edges, shells, façades, boundaries and networks.

Within the hypothesis of the Matrix, the leaf may be regarded as the first fully unfolded form after the circle-seed. It does not yet complete the cycle, but already makes the principal elements of the code visible: axis, distribution, layer, segment, edge, self-similarity and connection with the external environment. If the seed was a model of potential, the leaf is a model of manifest development. It demonstrates how concealed order becomes spatial organisation.

The leaf should not, however, be absolutised. Not all forms develop in a leaf-like manner. Some are primarily radial, others spiral, volumetric, networked or shell-like. Leaf-like unfolding is therefore one of the Matrix's key types, but not the only one. Its significance lies in the particular clarity with which it demonstrates the transition from axis to surface and from internal order to active edge. Together with the circle, spiral, flower, tree and network, the leaf constitutes one of the principal models of universal morphology.

Several characteristics of the leaf as a universal form of unfolding may be distinguished for the further development of the hypothesis. The first is the presence of an axis or principal direction. The second is a system of branches or distribution lines. The third is an unfolded surface. The fourth is segmentation or faceting. The fifth is an active edge. The sixth is the relationship between internal structure and the external environment. The seventh is self-similarity at different levels. The eighth is the possibility of a folded state and subsequent unfolding. These characteristics will Be important when analysing biological, geological, cosmic, and cultural material.

Thus, within the hypothesis of the Unified Matrix of the Universe, the leaf serves as a universal model of unfolding. It demonstrates how an unfolded form possessing an internal network, surface, segments, edges and a relationship with the environment arises from initial enclosure and axial direction. The leaf is not merely a botanical example, but a morphological image of development: concealed structure becomes visible, the axis becomes a plane, the boundary becomes an active edge, and potential form enters the space of interaction.

Leaf-like unfolding is therefore a necessary stage after the circle-seed. The circle-seed answers the question of how form begins. The leaf answers the question of how it unfolds. It demonstrates that development proceeds not as formless expansion, but as structured distribution in which every line, layer, facet and edge participates in the creation of the whole. The following section will examine these elements in greater detail: layer, facet and edge as the principal components of unfolded form.

7.2. Layer, Facet and Edge

The leaf-like unfolding of form does not occur as the simple spreading of a homogeneous mass through space. The development of form is almost always associated with articulation, differentiation and the formation of levels, regions, faces, segments and boundaries. Having considered the leaf as a universal model of unfolding, it is therefore necessary to turn to three key concepts: layer, facet and edge. These concepts allow us to describe how potential form becomes complex, internally organised and interactive with its environment.

The layer denotes the organisation of form into levels. It demonstrates that development possesses sequence and depth. Form is not flat in the sense of an empty surface. Even if it is perceived as a leaf, shell, plane, relief or image, it may contain levels, strata, tissues, zones, coverings, stages, superimpositions and internal transitions. The layer records the fact that form is not given immediately and in its entirety, but arises through accumulation, differentiation and structuring.

The facet denotes a face or segment of an unfolded form. If the layer is associated with depth and level, the facet is associated with the articulation of the surface. A facet is a region that belongs to the whole but possesses its own orientation, contour, function or rhythm. In a leaf, the zones between veins, lobes, segments and regions of the surface formed by the internal network may provisionally be called facets. In a crystal, facets are expressed as faces. In relief, they are manifested as slopes, planes and regions of the surface. In architecture, they appear as parts of a façade, faces of a volume and modular elements. In a symbolic composition, they may appear as ornamental segments, fields, tiers, triangles, petals or radial elements.

The edge denotes the active boundary of form. It is not merely a termination. In the morphogenetic sense, the edge indicates the place at which form interacts with the external environment, at which its internal order becomes visible at its limit, and at which growth, resistance, destruction, exchange, rhythm, curvature, undulation, serration or unfolding occur. The edge is not the final line that appears once form has been completed, but a zone in which form continually tests itself in the external world.

These three concepts are interconnected. The layer reveals the depth of unfolding. The facet reveals the articulation of the surface. The edge reveals the limit and the interaction. If form is considered only as a general contour, this internal complexity disappears. The hypothesis of the Unified Matrix of the Universe, however, requires form to be viewed not only externally, but as a system of transitions. Layer, facet and edge are therefore indispensable elements in the language of the Matrix.

In the circle-seed model, the layer remains concealed, the facet has not yet been differentiated, and the edge is still a shell. Everything changes in leaf-like unfolding. Concealed layering becomes visible, the surface is divided into regions and the boundary becomes an active edge. That which was gathered within the seed now emerges and becomes organised in space. Layer, facet and edge are therefore characteristics of unfolded form.

The layer is associated first and foremost with time. It frequently records a sequence of states. In biology, layers may arise as tissues, coverings, integuments, rows of petals, growth zones, annual rings and cellular strata. In geology, layers are expressed in sedimentary rocks, mineral bands, volcanic deposits, folds, metamorphic structures and stone veins. In the cosmos, layering may appear in nebular shells, expansion fronts, zones of different density, rings, luminous regions and levels of gas and dust. In culture, layers appear as architectural tiers, the nested circles of a

mandala, semantic levels of a symbol, ornamental rows and historical superimpositions within an image.

The layer is important because it gives form a history. Form does not merely exist; it preserves traces of its becoming. The annual rings of a tree demonstrate the time of growth. Sedimentary strata demonstrate the time of accumulation. Folds in rock reveal the time of pressure and deformation. The petals of a bud demonstrate the gradual organisation of the flower. Nebular shells may record stages in the ejection or expansion of matter. Architectural tiers may express compositional and symbolic hierarchy. The layer transforms form into a memory of process.

This is particularly important to the hypothesis of the Matrix. If form is a manifestation of morphogenesis, it must be read not only as a spatial structure, but also as a record of becoming. Layering demonstrates that development does not occur instantaneously. It leaves traces, levels and boundaries between states. Each layer may be the result of a particular stage, condition, stress or function. The layer is therefore one of the principal characteristics of the transition from potential to unfolded form.

In the leaf, layering is manifested not only anatomically. Morphologically, the leaf possesses levels of organisation: the central vein, lateral veins, fine network, tissue surface and edge. These levels are not arranged like geological strata, but they form a hierarchy. The principal axis establishes the first level. Lateral directions create the second. Fine connections form the third. The surface between them constitutes the fourth. The edge constitutes the fifth. Even an apparently flat form is therefore multilayered in a structural sense.

Unlike the layer, the facet indicates not depth, but the articulation of the surface. An unfolded form is rarely completely homogeneous. It is divided into regions. In a leaf, these regions are established by the veins. In a wing, they are established by veins, membranes and segments. In stone, they are formed by cracks, mineral zones, faces and veins. In relief, they appear as slopes, terraces, valleys and escarpments. In architecture, they are manifested in façade planes, columns, windows, portals and modules. In a symbolic composition, they take the form of petals, rays, triangles, sectors and tiers. The facet demonstrates that the whole is composed of distinguishable parts without losing its general coherence.

Faceting is particularly important to an understanding of organised complexity. If form develops as a solid mass, it remains poorly differentiated. When facets appear, however, form acquires internal articulation. Each face or segment may possess its own direction, inclination, contour, function and relationship to light, load, flow or meaning. A facet does not exist in isolation. It belongs to a system. Faceting therefore expresses the principle that the whole is preserved through the differences between its parts.

Facets are especially evident in a crystal. Crystal faces demonstrate that the internal order of a substance is manifested in its external geometry. A crystal does not assume an arbitrary form; its faces are connected with its internal structure. In this sense, the facet is the visible aspect of concealed order. Similarly, the region between veins in a leaf expresses the distribution of the internal network. In architecture, the plane of a façade expresses constructive and compositional logic. In a bas-relief, the face or plane of a figure expresses artistic organisation. The facet is a site at which internal structure emerges at the surface.

In geology, faceting may be manifested in the articulation of a relief surface. Slopes, escarpments, ridges, terraces, fault planes and the faces of stones and crystals create a structure in which the surface is not smooth. It consists of regions, each of which reflects a

particular direction of force, erosion, pressure, fracture or growth. Geological faceting is therefore a trace of the interaction between matter and process. It demonstrates that the Earth does not merely possess a surface, but a structured surface.

The concept of the facet must be applied cautiously to cosmic material, because nebulae and gas clouds do not possess solid faces in the ordinary sense. At the morphological level, however, one may speak of segments, regions, fronts, shells, filaments, luminous zones and areas of different density and brightness. These elements are not facets in the sense of crystal faces, but they perform a similar function by articulating the general form into distinguishable regions. In relation to the cosmos, it is therefore more appropriate to speak of facet-like segmentation or zonation than of facets in a strict material sense.

The edge completes this triad of concepts, but it is by no means the least significant. In morphogenesis, the edge is frequently the most active part of a form. It is here that growth encounters resistance, internal structure encounters external conditions, surface encounters space, one layer encounters destruction or continuation, and one facet encounters another. The edge demonstrates that form is not enclosed within itself. It continually stands in relation to that which lies beyond it.

In a leaf, the edge may be smooth, serrated, undulating, lobed, dissected, needle-like, curled or damaged. Its form depends upon the organisation characteristic of the species, the nature of growth, mechanical conditions, moisture, light, damage and the microstructure of the tissues. The leaf margin therefore records both internal morphogenetic order and external interaction. It demonstrates that form does not merely end, but operates at the boundary.

The edge is particularly important because it is a site of variability. The leaf's central axis may be relatively stable, while the edge is frequently the most variable part. The internal veins establish structural order, but the edge reveals the rhythm of growth and individual deviations. Serrations, waves, microfolds, curves, damage and asymmetries are visible precisely at the edge. The edge is therefore the zone in which the universal plan of form encounters the particular history of its development.

In geology, the edge is manifested as a coastline, fault line, erosion front, the edge of a stratum or crack, the boundary of a mineralogical zone, the contour of a stone, a slope or an escarpment. The geological edge is almost always active. A coastline changes under the influence of water, wind, sedimentation and tectonics. A crack propagates through a material. The edge of a stratum exposes the internal history of the rock. The contour of a stone is formed by weathering, impacts, pressure and time. The geological edge demonstrates that the boundary of matter is a site of process.

In the cosmos, an edge may also be active, although its physical meaning is different. The edge of a nebula, a shock-wave front, the boundary of a gas cloud, a shell surrounding a stellar object, the periphery of a galactic arm and a region in which radiation interacts with gas all reveal contact between different states of matter and energy. A cosmic edge may be diffuse, luminous, filamentary, ruptured or unstable. It is frequently at the edge, however, that the dynamics of the system become visible. The edge reveals where a cosmic form interacts with its surroundings.

In culture, the edge possesses compositional and symbolic significance. The frame of an image, the border of an ornament, the edge of a mandala, the contour of a figure, a façade line, portal, threshold, wall, domed shell and boundary of sacred space are all forms of the edge. In culture, the edge separates the internal from the external, the sacred from the ordinary, the centred from

the indeterminate, and the image from its ground. It may also constitute a site of passage: a door, portal, window, threshold or arch. The cultural edge therefore combines the function of a boundary with that of a passage.

Within the hypothesis of the Matrix, the edge should be understood as a continuation of the circle-seed's shell. In the initial closed form, the shell preserved potential. In the unfolded form, the shell becomes an edge. It ceases to be exclusively protective and becomes active. If the shell was the boundary of the concealed, the edge is the boundary of the manifest. It demonstrates how form exists after unfolding: no longer closed, yet not formless; open to the world, yet still preserving its own organisation.

This transformation of shell into edge is one of the central moments of leaf-like unfolding. The seed is protected by a covering. The leaf is open through its edge. The bud is enclosed by its outer petals. The flower is unfolded through its petal margins. A crystalline nucleus is separated from its environment, while the developed crystal possesses faces. Rock conceals its internal layers, but a fracture or outcrop brings them to an edge. The symbolic circle is closed, while an ornamental composition unfolds its periphery through rhythm. In every case, the boundary changes its function: from retention to interaction.

Layer, facet and edge are also associated with the principle of differentiation. Differentiation means that differences arise within a form without destroying the whole. Layers differ in position and time. Facets differ in their orientation and participation in the surface. Edges differ through their contact with the environment. A developed form is not homogeneous. It consists of differences held together by a common order. It is precisely this organised heterogeneity that constitutes a characteristic of morphogenesis.

If we return to the A–B–C–D model, layer, facet and edge relate primarily to stage C—differentiation. At stage A, form remains closed and potential. At stage B, an axis or direction appears. At stage C, the axis begins to generate multiplicity: layers, segments, branches, planes, edges and modules. At stage D, this differentiation becomes stabilised in an unfolded form. The concepts of layer, facet and edge therefore make it possible to describe precisely the moment at which form becomes complex.

The layer may be associated with vertical or depth-related differentiation, the facet with surface or planar differentiation, and the edge with peripheral differentiation. Together, they create a three-dimensional understanding of form. Even if an object appears flat, it possesses the depth of layers, articulation of the surface and an active boundary. The leaf-like model therefore cannot be reduced to a plane. It includes depth, surface and limit.

It is particularly important that the development of form does not proceed as an undifferentiated mass. An undifferentiated mass could increase in size without necessarily becoming a complex form. Morphogenesis requires articulation. In a living organism, cells form tissues, tissues form organs and organs form systems. In a leaf, tissue is organised through veins and surfaces. In geology, matter forms strata, folds, cracks and blocks. In the cosmos, matter is distributed into clouds, filaments, shells and zones of density. In culture, meaning is organised through signs, tiers, rhythms and compositional fields. Development is everywhere associated with the formation of distinguishable parts.

This does not mean that the world consists only of separate fragments. On the contrary, layer, facet and edge possess meaning only within a whole. A layer is a layer of something. A facet belongs to the surface of a whole. An edge delimits a form; it does not exist independently.

Differentiation is therefore not equivalent to disintegration. Disintegration destroys the connection between parts. Morphogenesis creates parts while preserving their inclusion within the whole. This is what distinguishes the unfolding of the Matrix from chaotic destruction.

The layer is also associated with depth of meaning. In cultural forms, layering often signifies not only physical superimposition, but semantic multiplicity. A single symbol may possess an external image, a mythological layer, a ritual layer, a cosmological layer and a philosophical layer. An architectural form may have structural, functional, aesthetic and sacred levels. A bas-relief may simultaneously be an image, a sign of power, a mythological narrative and a cosmological schema. In material belonging to the humanities, therefore, the layer acquires hermeneutic significance.

The hermeneutic layer must, however, be distinguished from the physical layer. A layer of rock and a layer of meaning are not the same. The language of the Matrix nevertheless allows them to be compared as different types of organisation into levels. In nature, a layer records a material process. In culture, a layer records a process of meaning. Both types of layering demonstrate that form may be multilevel. The standards of evidence and methods of analysis, however, will differ.

The facet also possesses particular significance in cultural analysis. Every complex composition is constructed from regions: figures, fields, ornamental segments, tiers, planes, areas of colour and geometrical elements. These facets organise perception. They direct the gaze, create rhythm, distinguish the centre and connect the parts. Faceting is especially evident in architecture: the façade, face, portal, window, column, niche, dome and tier. Here, the facet is not merely a surface; it is a mode of spatial thought.

The edge in culture likewise possesses a semantic function. A threshold separates one space from another. A frame separates an image from the surrounding world. A contour separates a figure from its ground. A wall separates the internal from the external. An ornamental edge may protect, complete, embellish, direct or sacralise a space. The cultural edge is therefore not only a line, but also a sign of transition. It demonstrates where one domain of being, meaning or perception gives way to another.

In biology, the edge is frequently associated with growth. In many living forms, the periphery is a zone of active change. The edge of a leaf, a petal, growing tissue, a colony, a coral or a healing wound all demonstrate that morphogenesis frequently occurs at the boundary. The centre may be relatively stable, while the edge remains dynamic. This allows the Matrix to be understood more deeply: development does not always originate exclusively from the centre. It may be sustained by an active periphery.

This understanding qualifies the simple schema according to which ‘the centre generates everything’. In real systems, centre, axis, layers and edge interact. The centre establishes organisation, but the edge responds to the environment. The axis establishes direction, but the periphery refines the form. The layer preserves the memory of the process, while the edge reveals its current state. The facet connects internal order with external surface. The Matrix is therefore not a hierarchy with a single controlling centre, but a system of reciprocal transitions.

The feedback between the edge and internal structure is particularly important. In a leaf, environmental conditions may affect the edge and, through it, the entire form. In geology, erosion of an edge may alter the relief. In the cosmos, interaction between a shell and the surrounding medium may change the form of a nebula. In architecture, the boundary of a building determines both its internal space and its perception. In a symbol, a frame or peripheral ornament may alter

the meaning of the centre. The edge therefore not only completes form, but also influences its internal organisation.

Layer, facet and edge also demonstrate that form possesses different types of boundary. Internal boundaries exist between layers. Surface boundaries exist between facets. A peripheral boundary exists along the external contour. These boundaries may be sharp or gradual, visible or concealed, stable or mobile. In living tissue, a boundary may be functional. In rock, it may be physical. In a nebula, it may be gradient-based. In culture, it may be semantic. The analysis of boundaries makes it possible to understand how form maintains difference within a whole.

Within the hypothesis of the Unified Matrix of the Universe, the boundary is a key concept because it is through boundaries that the concealed becomes manifest. The seed covering, a layer within a bud, a surface facet, a leaf margin, a stone contour, a fault line, a nebular shell and the frame of a symbol demonstrate different modes of organising a boundary. The Matrix cannot be understood without the boundary, because form always entails determinacy. Determinacy arises wherever there is a distinction between the internal and external, one level and another, one facet and the next, or form and environment.

Layer, facet and edge are also concepts of transition. One layer passes into the next. One facet passes into a neighbouring facet. The edge passes into the external environment. An unfolded form is therefore not a set of motionless elements. It consists of transitions. In this sense, the Matrix must describe not only the elements, but also the connections between them: how a layer is formed, how a facet is differentiated, how an edge becomes more complex and how a boundary becomes the site of a process.

In the leaf-like model, such transitions are especially clear. The central vein passes into lateral veins. The lateral veins pass into a fine network. The network passes into the tissue of the surface. The surface passes into the edge. The edge passes into the external environment. This sequence is not mechanical, but morphological. It demonstrates how internal order becomes distribution, and distribution becomes a boundary of interaction. It is this logic that makes the leaf a key model of unfolding.

In a geological model, a comparable sequence may take a different form: internal stress passes into a crack, the crack into a fault network, the network into an articulated surface, and the surface into an edge of relief or a coastline. In a cosmic model, a centre of activity passes into a shell, the shell into filaments and fronts, the fronts into peripheral edges, and the edges into interaction with the surrounding environment. In a cultural model, a central sign passes into compositional axes, the axes into segments, the segments into an ornamental periphery, and the periphery into a frame or boundary of sacred space. In every case, layer, facet and edge help to describe unfolding.

It must be emphasised that these correspondences do not imply a single physical mechanism. A leaf layer, rock stratum, nebular layer and semantic layer of a symbol differ in their nature. A crystal face, a relief facet and an architectural facet are different. A leaf margin, coastline, nebular edge and image frame possess different mechanisms of origin. At the level of the Matrix's language, however, they may be compared as different realisations of organisation into levels, articulation and boundary. This constitutes the meta-theoretical character of the hypothesis.

Layer, facet and edge also make it possible to avoid an excessively general discussion of the 'similarity of forms'. Rather than asserting that one object resembles another, specific questions may be posed. Does the form possess layers? How are they expressed? Are they associated with

time, function, pressure, growth or meaning? Are facets present? How do they articulate the surface? How are they related to an axis, centre or network? How is the edge organised? Is it smooth, serrated, undulating, ruptured, active, gradient-based or symbolic? Questions of this kind transform analogy into analysis.

This is particularly important to the hypothesis's future methodology. Layer, facet and edge may become descriptive parameters. Layering may be classified by type, number, depth, regularity and origin. Faceting may be classified by the size and orientation of the segments, their recurrence and their relationship to a network. The edge may be classified by its complexity, curvature, fractality, serration, undulation and degree of interaction with the environment. This will facilitate a transition from philosophical description to a more precise morphological classification.

Layer, facet and edge also help to explain why unfolded form frequently possesses beauty. Here, beauty arises not from external ornamentation, but from the visible organisation of differences. Layers create depth and rhythm. Facets create an interplay of planes and directions. The edge creates tension between the internal and external. When these elements are coordinated, form is perceived as simultaneously coherent and complex. This applies to a leaf, flower, stone, landscape, nebula, architectural structure or ornament. An aesthetic impression may constitute the first indication of morphological organisation, but it must be supplemented by analysis.

It is especially important that the edge is a site at which aesthetics and process converge. The undulating margin of a leaf is beautiful, but is also connected with growth and tissue stresses. A coastline is expressive, but is also associated with erosion and the dynamics of water. The edge of a nebula is impressive, but is connected with the physical processes of gas and radiation. An ornamental border embellishes, but also structures a composition. The beauty of an edge is therefore frequently the visible aspect of active morphogenesis.

The following section will examine the edge in greater detail, with particular attention to serrated and undulating edges. These forms are important because they demonstrate the rhythm of growth, tension within matter and interaction with the environment. A smooth boundary expresses relative uniformity, whereas serration and undulation reveal a differentiated process. The edge begins to speak the language of rhythm, repetition, resistance and variability.

Thus, layer, facet and edge are the principal elements of leaf-like unfolding. The layer demonstrates that form possesses depth, history and levels. The facet demonstrates that the surface is articulated into interconnected regions. The edge demonstrates that form actively interacts with its environment and manifests its individuality at the boundary. Together, they explain why the development of form does not proceed as a solid mass, but through the formation of levels, faces, segments and active boundaries.

Within the hypothesis of the Unified Matrix of the Universe, these concepts make it possible to proceed from the general image of the leaf to the specific morphology of unfolding. A leaf-like form becomes not merely an unfolded surface, but a complex system: the axis organises direction, layers record stages and depth, facets articulate the surface, the edge expresses contact with the environment, and the entire structure retains a connection with its initial potential wholeness. This is how the circle-seed becomes an unfolded form: not through formless expansion, but through the disciplined formation of differences.

7.3. The Serrated and Undulating Edge

The edge of a form is one of the most expressive zones of morphogenesis. In the preceding section, the edge was defined as an active boundary at which the internal organisation of a form enters into interaction with the external environment. It is now necessary to consider two particularly important types of edge: the serrated and the undulating. They are of fundamental significance to the hypothesis of the Unified Matrix of the Universe because they demonstrate that the boundary of form is rarely a simple line. In nature, the edge frequently becomes rhythmic, articulated, stressed, pulsating and self-similar.

A smooth boundary expresses relative uniformity. It may be associated with stable equilibrium, minimal resistance, symmetry or the completion of form. The serrated and undulating edge, however, indicate a different state. They demonstrate that form does not develop uniformly and that local differences of growth, stress, pressure, resistance, destruction or environmental interaction operate at its periphery. Such an edge is not a passive contour, but a record of process.

The serrated margin of a leaf provides a particularly clear example. Many leaves possess small or large teeth, waves, indentations, lobes, irregularities or incisions. These elements are not accidental ornamentation. They are associated with the nature of leaf-tissue growth, the distribution of veins, the mechanics of the surface, and interaction with water, light, air and external influences. The serrated margin demonstrates that the leaf periphery develops through a rhythm of small projections and indentations. Form appears repeatedly to enact an emergence beyond its own boundary.

Serration may be regarded as a local intensification of the edge. Each tooth is a small projection, a small point of activity and a small direction of growth. If a smooth edge denotes a continuous limit, a serrated edge transforms that limit into a series of small events. The edge becomes not a single line, but a sequence of rhythmic impulses: projection–indentation–projection–indentation. In this sense, serration is a form of peripheral differentiation. It demonstrates that an unfolded form continues to become articulated even at its outermost limit.

The undulating edge has a similar but not identical significance. A wave does not divide the edge as sharply as a tooth. It creates a smooth oscillation of the line. Undulation expresses rhythm, but in a more fluid, continuous and gentle manner. In biological forms, an undulating edge may be associated with uneven tissue growth, curvature of the surface, mechanical stresses, changes in moisture, the direction of light or the distinctive morphology of a species. In geological forms, undulation may reflect the action of water, wind, pressure, folding or erosion. In cosmic structures, it may be expressed by fronts of matter, shock waves, cloud boundaries and turbulent contours. In culture, it may be expressed through ornamental rhythm, decorative lines, movement, flow and vitality.

The serrated and undulating edge share a common foundation: both demonstrate that the boundary of form is not neutral. It possesses its own dynamics. At the edge, the internal order of form encounters external inhomogeneity. If the internal structure tends towards a particular type of growth or distribution while the external environment resists, directs, constrains or intensifies this process, the edge becomes complex. Serrations and waves may therefore be regarded as visible traces of the dialogue between form and environment.

Within the hypothesis of the Matrix, the edge is the site at which a universal structural principle acquires an individual pattern. The centre and axis may establish a general order, and the layers

and facets an internal organisation, but it is often the edge that reveals the uniqueness of form. Two leaves may possess a similar axis and venation, yet their margins will differ. Two coastlines may be governed by general laws of erosion and relief, yet their contours will be unique. Two nebulae may possess shell-like organisation, yet their peripheral filaments and edges will be distinctive. The edge is therefore a zone in which the Matrix becomes individualised.

Serration is particularly important as a model of the repetition of small differences. Each tooth resembles its neighbour, but is not identical to it. Rhythm arises without mechanical uniformity. This resembles natural fractality: what is repeated is not an exact figure, but a principle. A serrated leaf margin, the line of a mountain ridge, a coastal contour, the edge of a crack, the scalloped boundary of a cloud or an ornamental border may display a comparable principle of repetition with variation. In this sense, the serrated edge is a small fractal field of form.

Undulation is likewise associated with self-similarity, but through a different type of repetition. A wave may recur as a rhythm of curves, amplitudes and smooth deviations. In nature, undulating forms frequently arise where there is flow, pressure, compression, oscillation, uneven growth or interaction between surfaces. The wave is a form in which the line does not break, but curves. It demonstrates the transition from direct to oscillatory movement. The undulating edge may therefore be understood as a gentle form of asymmetry, in which order is manifested through continuous deviation.

In biology, the leaf margin is one of the best examples of peripheral morphogenesis. A leaf grows not only from its centre or base; its periphery also participates in the formation of its final shape. Different regions of the edge may grow at different rates, creating teeth, waves, lobes or incisions. Veins may extend towards the edge, reinforcing individual regions. The edge consequently becomes a map of local growth. It demonstrates where the form emerged outwards more actively, where it was retarded, where it curved and where it reproduced the internal rhythm of venation.

This makes it possible to regard a serrated edge as a continuation of the venation. In certain leaves, the teeth are associated with the terminations or directions of the veins. Each tooth may then be understood as a peripheral expression of the internal network. Internal distribution reaches the boundary and forms its rhythm. The edge is not an independent contour, but a result of the leaf's entire internal organisation. This is exceptionally important to the hypothesis of the Matrix: the periphery is not detached from the centre, but constitutes its unfolded trace.

The edge depends not only upon the internal network, however. It also responds to the external environment. Moisture, light, temperature, mechanical damage, insects, wind and growth conditions may alter the form of the edge. The edge therefore combines hereditary or structural order with the particular history of existence. It reveals not only the type, but also the fate of the form. In this sense, the edge is a biographical zone of morphology.

In geology, the serrated and undulating edge are manifested in particularly diverse ways. A mountain ridge may possess a serrated silhouette. A coastline may be winding, scalloped, undulating or ruptured. A fault line may possess irregular edges, branches and escarpments. The margin of a glacier may be serrated and dissected. The contour of a stone may be smoothed, chipped, undulating or rough. All these forms arise through the interaction of matter with environmental forces: erosion, pressure, friction, water, ice, wind, temperature, tectonics and time.

The coastline is an especially powerful example of an active edge. It separates land from water, but this separation is constantly changing. Waves erode the shore, sediment accumulates, rivers transport material, tides and storms alter the contour, and different rocks offer different degrees of resistance. A coastline is therefore rarely smooth. It curves and fragments, forming bays, capes, gulfs, lagoons, spits, cliffs and escarpments. Its undulation and serration are not decorative, but traces of the prolonged interaction between two environments.

In this sense, the coastline is morphologically comparable to the leaf margin. A leaf and a coast naturally possess different mechanisms. Both, however, exhibit an active periphery at which internal structure encounters external conditions. The leaf margin expresses tissue growth and interaction with air, light and moisture. The coastal edge expresses the geological resistance of land and the dynamics of water. In both cases, the edge is not a line on a map, but a zone of process.

The serrated silhouette of mountains may likewise be regarded as a manifestation of a stressed edge. A mountain ridge is not merely the upper line of relief. Its serration may be associated with tectonic uplift, erosion, differences in the resistance of rocks, glacial processes, faults and rocky projections. The edge of a mountain reveals a history of pressure, destruction and resistance. It makes the Earth's deep structure visible at the boundary with the sky. In morphological terms, the mountain edge is an active line between dense matter and open space.

A crack also possesses edges. Attention is frequently directed towards the line of the crack Itself, but its edges—irregular, serrated, branching and sometimes undulating—are no less important. The edge of a crack demonstrates how a material resisted rupture. It records the material's microstructure, the direction of stress, local weaknesses, branches and points of arrest. A crack is therefore not merely a rupture, but an event that generates form. Its serrated edge demonstrates that even destruction may possess a morphogenetic pattern.

In stone textures, serration and undulation may appear as veins, bedding lines, irregular mineral boundaries, folded bands and the contours of inclusions. Here, the edge may be internal rather than external. The boundary between layers or minerals within a stone is also an edge. It demonstrates the transition between states of matter. The concept of the edge should therefore not be confined to the external contour of an object. The internal boundary of a layer, facet or inclusion may likewise constitute an active edge in the history of form.

In cosmic objects, the edge frequently takes the form of a filamentary, scalloped, ruptured or undulating boundary. Nebulae may possess shells with irregular edges, cloud fronts, radial or thread-like structures, and regions of sharp or gradual transition in brightness. These edges are associated with gas dynamics, radiation, shock waves, magnetic fields, turbulence and interaction with the surrounding interstellar medium. A cosmic edge is rarely a solid line; it is more often a gradient zone. It is precisely for this reason that it is especially interesting: it reveals a process within a distributed medium.

Particular caution is required when analysing cosmic edges. Images of nebulae and galactic structures are frequently the products of data processing, the selection of wavelength ranges, colour coding and contrast enhancement. Conclusions cannot therefore be based solely upon visual impression. If shells, filamentary edges, fronts, ruptures, layered boundaries and recurrent contours are consistently identified in images, however, they may become objects of morphological analysis. In such cases, the edge is considered as a structure in the distribution of matter and radiation, rather than as a decorative image.

The undulating cosmic edge is particularly interesting Ie it may reveal uneven expansion or gas interaction. If a nebular shell expands into an inhomogeneous medium, its edge may become scalloped, ruptured or filamentary. If gas flows collide, folds, waves and fronts may arise. These forms are morphologically comparable with waves in liquids, folds in fabric or cloud edges, but they possess their own physical mechanisms. It is therefore necessary to speak of a structural analogy of edges rather than an identity of processes.

In cultural forms, the serrated and undulating edge are frequently employed intentionally. Ornamental borders, serrated friezes, undulating lines, petal-shaped frames, radial haloes, zigzags, meanders, crenellated architectural terminations and wave-like decoration all demonstrate that human beings perceive the edge as an important semantic and aesthetic zone. The edge embellishes, protects, separates, establishes rhythm, directs the gaze and creates an impression of movement or energy. In culture, the edge is rarely neutral; it frequently bears symbolic significance.

A serrated edge in ornament may express power, protection, fire, light, radiation, boundary or tension. An undulating edge may express water, movement, life, flow, softness, rhythm or transition. These meanings naturally depend upon the particular culture and context and cannot be universalised without historical analysis. Morphologically, however, these forms demonstrate that the edge is perceived in symbolic systems as an active site of form. Human beings do not leave the boundary empty; they charge it with rhythm.

In architecture, the edge appears in cornices, pediments, battlements, arches, undulating façades, stepped terminations, domed shells, portals and decorative lines. The architectural edge determines the silhouette of a structure, the boundary between internal and external and the building's relationship to the sky, ground, street or square. A serrated or undulating silhouette may intensify the impression of movement, protection, rhythm or vertical aspiration. Architecture thereby demonstrates a cultural and technical appropriation of the morphogenetic role of the edge.

The serrated and undulating edge are also important to the hypothesis of the Matrix because they demonstrate the transition from simple geometry to living complexity. The circular boundary of the initial form was simple and uniform. Leaf-like unfolding transforms it into a complex edge. This transition may be described as the complexification of the circumference. A simple line begins to oscillate, fragment, produce projections, repeat rhythms and respond to the environment. Initial symmetry thereby becomes organised asymmetry.

The serrated edge may be regarded as a discrete form of this complexification. It consists of individual projections and indentations. The undulating edge may be regarded as its continuous form, in which the line deviates smoothly. The two types may be combined: an edge may be both undulating and serrated, coarsely lobed and finely toothed, smooth at one scale and articulated at another. Such combinations are especially important to fractal analysis because they demonstrate the multiscale complexity of a boundary.

The fractal dimension of an edge may become one of the future instruments for testing the hypothesis. A smooth edge has one degree of complexity; a serrated edge or coastline possesses another. The greater the degree of articulation and self-similarity across scales, the more complex the morphology of the edge. In biology, this may apply to leaves and petals; in geology, to coastlines and cracks; in the cosmos, to shells and fronts; and in culture, to ornamental and architectural contours. The methods of measurement will naturally differ, but edge complexity itself may serve as a shared parameter.

The edge is also associated with rhythm. Serrations and waves do not merely disrupt smoothness; they create repetition. The rhythm of an edge may be regular, approximately regular, irregular, fractal, chaotic or hierarchical. In a leaf, rhythm may be associated with veins and growth. Along a coastline, it may be associated with the material and the action of water. In ornament, it may be associated with an artistic canon. In a nebula, it may be associated with physical inhomogeneities. Rhythm is a mode of organising differences. It demonstrates that asymmetry may be a recurrent structure rather than chaos.

In this sense, the serrated and undulating edge are forms of peripheral rhythm. The centre establishes a beginning, the axis a direction, layers depth, facets the surface, and the edge the rhythm of contact. It is at the edge that form begins to 'sound' as a sequence of small deviations. This figurative expression may be understood rigorously: the edge records a series of local morphogenetic events. Every tooth, curve, wave, projection or indentation is a trace of the distribution of growth, resistance or external influence.

The edge also reveals tension within form. A wave may arise where there is compression, tension, flow or uneven growth. Serration may arise where the periphery becomes divided into local zones of activity. A fold may arise where the surface cannot distribute growth or pressure evenly. The edge is therefore associated not only with boundary, but also with internal tension. It demonstrates how form responds to an excess or deficiency of space, environmental resistance and differences in the rate of development.

In a leaf, an undulating margin may result from different parts of the tissue growing at different rates. If the edge grows faster than the inner region, it may curve or undulate. If certain regions are more active than others, serration or lobing may arise. Comparable principles, operating in different materials, may be observed in folds of fabric, geological layers, coastal contours and cloud fronts. This does not imply a single mechanism, but reveals a recurrent morphological situation: unequal development of parts creates a complex boundary.

The edge is also a site of vulnerability. It is the first to encounter external influences. A leaf is damaged from its margins. A shore is eroded along the line of contact with water. A stone is chipped at its edges. An architectural façade ages at boundaries and projections. A nebular shell interacts with its environment at the periphery. The edge is therefore not only active, but vulnerable. It demonstrates that an unfolded form is always exposed to the risk of change. In this sense, the edge is a zone of historicity: the effects of time are inscribed upon it.

The vulnerability of the edge is not merely a weakness, however. It is through the edge that form can adapt, expand, exchange and respond. A closed form is protected but limited. An unfolded form is vulnerable but active. A leaf could not perform its function without its extensive open surface and edge. A coastline creates ecological and geomorphological transition zones. An architectural edge creates entrances, façades and interaction between the building and the city. A symbolic edge creates a frame and a transition of meaning. The edge is therefore both the cost And the condition of unfolding.

Within the hypothesis of the Matrix, this proposition possesses a profound significance. The development of form is always associated with emergence from protected enclosure. The circle-seed preserves potential, while the leaf unfolds it towards the world. At the moment of unfolding, the edge arises, bringing with it interaction, complexity, vulnerability and variability. The serrated and undulating edge demonstrate that unfolding is never completely smooth. It always proceeds through rhythms and tensions.

A serrated edge may also be regarded as a series of small axes. Each tooth possesses a direction of projection. It appears to reproduce the general principle of growth in miniature: base–apex–lateral boundaries. When teeth are repeated many times, the edge becomes a microfield of directions. This is especially interesting for fractal analysis of leaves and ornaments. The large form possesses a principal axis, while the edge contains numerous small directions. The periphery thus reproduces the principle of axiality at a smaller scale.

The undulating edge, by contrast, may be understood as a series of small folds. It does not establish sharp axes, but creates curves. Each curve is a small transition between projection and indentation. If undulation is considered as a form of folding, it connects this section with the next, on the fold and unfolding. The undulating edge demonstrates that the edge is not merely a line, but a surface capable of curving. It marks the beginning of the folded logic of form.

The edge may also be associated with the concept of the threshold. It separates the Internal from the external, while simultaneously serving as a place of transition. Through its edge and surface, the leaf exchanges with the external environment; the shore is a transition between water and land; a person enters a space through an architectural threshold; and a frame separates an image from the world while simultaneously addressing it to the viewer. The edge therefore not only limits, but organises transition. Serration and undulation make this transition more complex, rhythmic and expressive.

At the symbolic level, serrated and undulating edges frequently intensify the impression of energy. A radial or serrated halo around a centre makes that centre active. An undulating line around a form creates a sense of movement. The petal-like periphery of a mandala transforms the circle into an unfolded form. A zigzag may express tension, lightning, force, danger or a boundary. A wave may express water, breath, life or flow. These meanings differ between cultures, but morphologically they are associated with the activation of the edge. The edge begins not merely to delimit, but to radiate, move and vibrate.

This is especially important to the hypothesis of the Matrix when ancient symbols, bas-reliefs, ornaments and sacred geometry are analysed. If a composition possesses a serrated, radial, petal-like or undulating periphery, it should be described not as chance decoration, but as a mode of morphological unfolding. Historical context must nevertheless be taken into account. The same serrated motif may possess different cultural meanings. The Matrix may analyse its structural function, but should not replace the particular cultural interpretation.

Nor should the serrated and undulating edge be overvalued in the analysis of nature. Not every irregularity is a significant morphogenetic characteristic. Some irregularities may be accidental damage, image noise, an effect of erosion without a stable pattern or the result of photographic processing. A structural edge must therefore be distinguished from accidental deformation. A structural edge is connected with the general organisation of form, repeats a rhythm and corresponds with veins, layers, facets, flows or fronts. Accidental deformation does not form a stable morphological pattern.

This distinction is particularly important to the future methodology. Several questions should be asked when analysing an edge. Does it possess a recurrent rhythm? Is it connected with the internal structure of the form? Does its complexity recur at different scales? Is its serration or undulation the result of growth, stress, flow, destruction or cultural intention? Can the complexity of the edge be measured? Is there a correspondence between the edge and an axis, layer, facet or network? Only after such questions have been addressed can the edge become an analytical characteristic of the Matrix.

The serrated and undulating edge also help to clarify the relationship between order and chaos. At first glance, an irregular edge may appear chaotic. On closer examination, however, it frequently reveals rhythm, self-similarity, repetition and a connection with internal structure. This demonstrates that natural order may be irregular. It need not be smooth and regular. The Matrix is manifested not only in a symmetrical centre, but also in a complex periphery. This is an important extension of the hypothesis: universal form is not confined to ideal figures, but includes dynamic boundaries.

In this respect, the edge is where the Matrix becomes most ‘alive’. The centre may be strict, the axis clear, the layer sequential and the facet definite. The edge, however, almost always carries variation. It demonstrates that form is undergoing a process, interacting, resisting and changing. Analysis of the edge therefore makes it possible to discern not only the structure, but also the energy of form. Serration and undulation are visual characteristics of this energy.

It may be said that the serrated edge expresses the impulsive energy of form, while the undulating edge expresses its oscillatory energy. The former is manifested through projections and interruptions of rhythm, the latter through the smooth movement of a line. In reality, these types may be combined. A leaf may possess teeth along an undulating margin. A coast may be undulating at a large scale and serrated at a smaller one. An ornament may combine zigzags and waves. A nebula may possess a smooth shell with scalloped ruptures. Such combinations demonstrate the multilayered dynamics of the periphery.

The serrated and undulating edge are also associated with the concept of unfolding. When a form unfolds, its edge expands, becomes more complex and begins to interact with the environment. The petal margins of a flower diverge from the centre. The margin of a leaf unfurls from a folded state. The edge of a fold may flatten. In a geological stratum, an exposed edge reveals the internal layers. In a nebula, an expanding shell creates a peripheral structure. In a symbol, an ornamental border unfolds the centre outwards. The edge is a visible trace of unfolding.

This is why the following section on the fold and unfolding naturally continues the subject of the edge. An undulating edge frequently arises from a fold or creates an impression of folding. A serrated edge may result from the articulation of an unfolded surface. The fold demonstrates that form was once folded, while the edge reveals how it has unfolded. If the seed was a closed beginning and the leaf an unfolded surface, the fold explains the mechanism of transition between the closed and unfolded states.

Thus, within the hypothesis of the Unified Matrix of the Universe, the serrated and undulating edge are not secondary details, but important characteristics of active morphogenesis. They demonstrate the rhythm of growth, tension within form, the distribution of internal forces, interaction with the external environment, self-similarity, variability and individuality. Through the edge, it becomes apparent that form does not merely possess a limit, but lives at that limit. It completes itself while simultaneously opening itself to the world.

The edge of form is therefore one of the most informative zones for analysing the Matrix. A smooth boundary indicates uniformity, while the serrated and undulating edge indicate process. They record where form has grown, resisted, curved, fragmented, interacted, repeated a rhythm and created an individual contour. They manifest the transition from the simple circumference of the circle-seed to the complex periphery of unfolded form. Analysis of the edge therefore becomes an indispensable stage in understanding leaf-like unfolding.

7.4. The Fold and Unfolding

The concept of the fold is one of the keys to understanding the leaf-like unfolding of form. If the circle-seed expresses initial potentiality and the leaf an unfolded surface, the fold explains the transition between them. Form does not appear from nothing or emerge as an instantaneously completed structure. In most cases, it passes through a state of being folded, compressed, latently organised or internally stressed. The fold is a morphological image of this state: form is already present as a possibility, but has not yet unfolded fully.

The fold connects enclosure with unfolding. it demonstrates that a surface may be larger than it appears in its folded state. A leaf within a bud, or a young leaf, may be folded, twisted, rolled, compressed or protected. A flower bud contains petals that have not yet unfolded. An insect wing may remain folded and subsequently open. Fabric may possess creases, curves, superimpositions and concealed regions. In every case, the fold retains form in a compressed state while simultaneously preparing it for unfolding.

Within the hypothesis of the Unified Matrix of the Universe, the fold is important because it allows form to be understood as more than a completed external contour. Before unfolding, form may be invisible, partially concealed, packed or nested within itself. It is not created from emptiness when it unfolds, but becomes manifest. The fold demonstrates that visible development is frequently a process of flattening out, unfurling, emerging and passing from internal compactness to an external plane or volume.

In biology, the fold is a fundamental morphogenetic principle. Leaves are folded within leaf buds, petals within flower buds, while embryonic tissues curve and form complex structures, and organs develop through protrusions, invaginations, bends, tubes, cavities, shells and layers. Living form rarely develops through a simple increase in mass. It curves, divides, rolls, flattens out and produces surfaces, boundaries and internal spaces. The fold is therefore not an accidental detail, but one of the means by which a living body creates complex form.

The young leaf demonstrates the relationship between fold and unfolding with particular clarity. Before it has fully unfurled, it may be folded along its central vein, rolled, pleated, curled inwards or outwards. In this state, the future leaf surface already exists, but does not yet perform its function fully. Its area is concealed. Its edge is not manifest. Its veins have not yet emerged as an open network. When the leaf unfolds, the folds separate, the plane expands, the edge becomes active and the internal structure becomes visible. This is leaf-like unfolding in the literal sense.

The flower bud provides another example. Its petals are folded around the centre, forming a closed structure. The flower's future radiality already exists within the bud, but remains concealed. The opening of the bud is not the appearance of petals from nothing, but a transition from a folded, protected and internal structure to an open, visible and peripheral form. At the moment of unfolding, the fold becomes a petal, the concealed edge becomes an external edge, and internal layering becomes the visible multilayered organisation of the flower. The bud demonstrates that the fold is a means of storing future form.

The fold is also associated with economy of space. A large surface may temporarily be enclosed within a small volume. A leaf blade, petal, wing, fabric or membrane may be folded in order to occupy less space, remain protected and await the conditions required for unfolding. This has an important morphological significance: form may be spatially compressed without losing its future structure. The fold allows potential form to exist in a compact state. It is therefore one of the mechanisms of transition from seed to leaf and from the concealed to the manifest.

In a broader sense, the fold is a model of concealed complexity. Outwardly, a folded form may appear simple, dense or closed. Internally, however, it already possesses a surface, direction, layer, edge and future periphery. To perceive this complexity, one must either wait for the form to unfold or understand the principle of its folded organisation. The fold therefore requires a particular kind of analysis. It does not always display form directly. It requires reconstruction: what is concealed within, which surfaces are superimposed, which edges will become external, which lines will become axes and which layers will unfold?

Within the hypothesis of the Matrix, the fold may be understood as an intermediate state between potential wholeness and unfolded form. The circle-seed still retains form as compact potential. The leaf already unfolds it into a surface. The fold lies between them: form has begun to differentiate, but has not yet opened fully. It contains difference while retaining it in a compressed state. It prepares asymmetry while potentially preserving external enclosure. It is the concealed movement of form prior to its explicit emergence.

The fold also demonstrates that the development of form may proceed through Internal tension. A folded surface contains the potential energy of unfolding. It may be compressed, stretched, pressed, twisted or held by a covering or neighbouring structures. Unfolding occurs when this retention weakens or when internal growth overcomes the previous compactness. In biology, this may be associated with tissue growth, changes in turgor, seasonal conditions, the maturation of a bud or the development of a leaf. In other systems, comparable transitions may be associated with pressure, tension, temperature, humidity, mechanical influences or energetic state.

In geology, the fold possesses a direct and particularly expressive significance. Geological folds arise when rock strata undergo pressure, compression, deformation and changes in position. Initially horizontal or otherwise ordered strata may bend, forming anticlines, synclines, waves and complex folded structures. Here, the fold is not a metaphor, but a real form of matter. It demonstrates that dense terrestrial structure may not only fracture, but also bend while preserving the continuity of its layers.

The geological fold is important to the hypothesis of the Matrix because it makes the internal stresses within matter visible. Rock does not merely lie in layers. It may be compressed, rotated, bent, uplifted, lowered or crumpled. The fold reveals the history of forces that acted upon the material. Within it, the layer becomes a line of time and the curve a trace of pressure. The geological fold is therefore a form of memory. It does not unfold like a leaf in a biological sense, but reveals the history of the Earth through the morphology of layers.

Folded relief also demonstrates that form may arise through resistance. If a material fractures completely, a rupture arises. If it is capable of deformation, a fold arises. The fold represents a compromise between the preservation of wholeness and a change in form. It demonstrates that a structure does not disappear under the influence of force, but passes into a new state. In this sense, the fold is one means of producing organised asymmetry. It disrupts previous uniformity without destroying the internal connection between layers.

Within the leaf-like model, the geological fold possesses particular significance. A leaf unfolds through the flattening of folds. A geological layer, by contrast, may fold under pressure. Both processes, however, involve the relationship between surface, stress and form. In one case, the fold is overcome so that a surface may unfold. In the other, a fold is formed as a result of deformation of the surface. These directions are different, but they reveal the same morphological problem: the surface is not passive. It may become compressed, curved or flattened out, preserve traces of forces and carry history.

A fold may be internal as well as external. In living tissues, internal folds increase surface area and create cavities, channels, coverings and complex organs. In geology, internal folds of strata may remain concealed within rock masses and become visible only in section or outcrop. Veins and bands within stone may curve, creating internal undulation. In architecture, internal folds of space may be manifested as vaults, niches, arches, transitions, stairways and domed structures. In culture, the fold may signify concealed meaning, a nested level or an internal composition.

The relationship between folding and increased surface area is especially important. In many natural systems, folding makes it possible to accommodate a large surface within a limited volume. This is evident in biological membranes, tissues, leaves, petals, intestinal structures, lungs and neural structures. The fold allows a system to increase contact, exchange, distribution or perception without simply increasing its external volume. In this sense, the fold is a means of increasing the complexity of form without sacrificing compactness. It demonstrates that development may proceed not only through outward growth, but also through the internal curvature of a surface.

This proposition is particularly important to the hypothesis of the Matrix. The unfolding of form does not always signify simple expansion through space. Form may sometimes develop through folding, internal surface complexity and enfoldment. The leaf is an unfolded model. The fold, however, demonstrates that folding and unfolding are interconnected processes. For a form to unfold, it frequently must first have been folded. For an extensive surface to exist within a small volume, it must be folded. For a structure to become more complex, it may form internal folds. The fold is therefore a universal mechanism connecting compactness with complexity.

The fold is also closely associated with the edge. An undulating edge may be regarded as an edge in a state of minor folding. A serrated edge may be regarded as a sharper peripheral articulation. A lobed edge may be understood as the deeper penetration of folded logic into the body of a form. If an edge begins to curve, recur and create projections and indentations, it effectively becomes a line of folding. Analysis of the edge therefore leads naturally to analysis of the fold. The edge demonstrates how form interacts with the environment at its limit, while the fold demonstrates how the surface itself responds to stress.

The fold may be understood as an internal boundary without complete separation. A rupture separates parts. A fold distinguishes regions of a surface while preserving their connection. This makes it especially important to an understanding of differentiation. Form may become complex not only through the separation of parts, but also through their bending, superimposition, rotation, partial concealment and unfolding. The fold creates difference without disintegration. It allows the whole to become multilayered without ceasing to be whole.

In biological morphogenesis, this is of fundamental importance. Many structures within an organism arise not through the simple addition of new parts, but through bending, invagination, evagination, coiling and the formation of cavities. The fold creates internal space. It transforms a surface into three-dimensional organisation. It enables the formation of tubes, chambers, shells, pockets, layers and internal boundaries. The fold is therefore not only a model of leaf unfolding, but also one of the means by which the complex living body is formed.

In philosophical terms, the fold demonstrates that the internal and external are not always rigidly separated. What was an external surface may become an internal cavity. What was concealed within may emerge externally. What was an edge may become a fold. What was a plane may become a volume. The fold alters spatial relationships without destroying the continuity of form. It is a mechanism of transition between the internal and external. This is particularly important to

the Matrix, since the entire hypothesis is constructed around the transition from the concealed to the manifest.

In cultural forms, the fold also possesses figurative and symbolic significance. A fold in fabric or clothing, a curtain, scroll, book, fan, drapery, veil, concealed space and revealed space are all cultural forms in which concealment and unfolding become meaningful actions. A scroll stores text in a rolled state and reveals it when unrolled. A book contains pages that are opened successively. A curtain conceals the stage and subsequently reveals it. A fan is compactly folded and then opens into a radial surface. These cultural forms demonstrate that human beings have long understood the fold as a boundary between the concealed and the manifest.

Architecture also employs the logic of the fold. A vault, arch, dome, niche, turn of a staircase, curving wall, folded façade, shell structure and multilayered portal are all forms in which space is not merely delimited, but folded. The architectural fold organises movement, the gaze, transition, entrance and internal depth. It enables a building to become not a simple volume, but a system of nested spaces. In this sense, architecture translates the morphogenetic fold into a cultural and technical form.

In ornament and symbolism, the fold may be manifested as repetition, nesting, rotation, intersection, multilayered organisation and the superimposition of figures. The Shri Yantra, mandala, rosette, complex ornament and bas-relief composition may be regarded as symbolic forms of unfolding through nested and intersecting elements. Here, the fold need not be physical. It may be compositional: form appears to fold and unfold meaning through levels, intersections, internal boundaries and recurrent fields.

The cultural fold cannot, however, be identified with the biological or geological fold. In biology, the fold arises through living morphogenesis. In geology, it arises through pressure and deformation. In architecture, it arises through design, construction and material. In symbolism, it arises through composition and meaning. The Matrix as a meta-theoretical language allows them to be compared at the level of morphological function: the fold conceals, retains, differentiates, increases surface area, creates internal space and prepares unfolding. Their mechanisms and standards of evidence nevertheless remain different.

The concept of the fold must be applied with particular caution to cosmic structures. Cosmic matter does not fold like a leaf or fabric. Images of nebulae, gas and dust clouds and shells may, however, reveal filamentary curves, fronts, waves, layered arcs, shell-like structures and scalloped edges. Morphologically, these may resemble folds, but physically they are associated with gas dynamics, magnetic fields, shock waves, gravity and radiation. It is therefore appropriate to speak not of folds in a literal sense, but of the fold-like organisation of fronts and shells.

Such cautious usage is important to preserving scientific rigour. If a nebula possesses undulating arcs, it cannot be claimed that it ‘folds’ like biological tissue. It may, however, be analysed as a structure in which matter forms wave-like, shell-like or frontal lines. The fold here becomes not a causal explanation, but a morphological term describing curves and levels. This corresponds to the general principle of the hypothesis: similarity of form does not imply identity of mechanism.

The fold also helps to explain how form preserves memory. A folded surface records its preceding state. A geological fold records pressure. A fold in fabric records movement and position. A fold in a leaf records a stage of growth. A book records the sequence of its pages. Architecture records the trajectory of space. A bas-relief records superimposed semantic and visual levels. The fold is a form of memory because it preserves the trace of a process even after that process has ended.

An unfolded leaf may retain traces of its earlier rolled state; folded rock preserves the trace of a tectonic event; and a cultural form preserves the trace of ritual unfolding.

In this respect, the fold is associated with time no less than the layer. The layer records a sequence of accumulation. The fold records deformation, concealment, stress and unfolding. The layer tells us that form arose in stages. The fold tells us that form changed position, was compressed, curved and concealed, and subsequently unfolded or became deformed. Together, the layer and fold provide a profound understanding of morphogenesis as the history of form.

The fold is also associated with the facet. When a surface folds, it creates faces, planes and regions with different orientations. The fold may generate faceting. In folded paper or fabric, each side of the fold becomes a separate plane. In a geological fold, the layers change inclination and create different surfaces. In architecture, a folded shell creates faces. In ornament, intersecting lines create segments. The fold is therefore a mechanism for forming facets. It articulates the surface without ultimately breaking it.

Fold, layer, facet and edge form a unified system of concepts. The layer provides depth, the facet surface articulation, the edge an active boundary, and the fold a mechanism of transition between the concealed and unfolded, plane and volume, internal and external. In leaf-like unfolding, these elements are constantly connected. A leaf possesses tissue layers, facet-like regions between veins, an edge and folds in its young state. A flower possesses layers of petals, petal margins and folds of unfolding. Stone possesses layers, faces, edges and folded structures. A cultural composition possesses levels, segments, frames and unfolding semantic fields.

The concept of unfolding forms the second part of the present section. Unfolding is the process through which a concealed or folded structure becomes manifest. It may be biological, geological, cosmic, cultural or symbolic. In biology, a leaf, flower, wing, tissue or organ unfolds. In geology, unfolding may occur through the exposure of strata, faulting, erosion, uplift, cutting or the becoming-visible of folded structures. In the cosmos, unfolding is associated with the visualisation of structures, the expansion of shells, the propagation of matter and the manifestation of luminous fronts. In culture, unfolding is associated with the unrolling of a symbol, reading, ritual, the opening of space and interpretation.

Unfolding does not signify merely an increase in size. It signifies a transition into manifestation. A leaf becomes a plane accessible to light. A flower reveals its centre and petals. A geological layer emerges at the surface. A bas-relief reveals an image in stone. An architectural portal opens an entrance. A scroll reveals a text. In every case, unfolding is associated with visibility, function and interaction. The concealed becomes accessible while simultaneously entering a new phase of vulnerability and activity.

Within the hypothesis of the Matrix, unfolding continues the process of symmetry breaking. The initial circular or closed form preserved potentiality. The fold retained the unfolded structure in a compressed state. Unfolding introduces it into space. It produces an axis, surface, edge, layers, facets and rhythm. Unfolding is therefore not an external event, but a central moment of morphogenesis. Form becomes itself precisely through unfolding.

Unfolding is not always complete, however. Some forms unfold only partially. A leaf may remain deformed. A bud may fail to open fully. A geological layer may be visible only within an outcrop. A cultural symbol may remain partly concealed without knowledge of its context. A cosmic form may be accessible only within a particular observational range. Unfolding is therefore always

relative. Visible form does not exhaust the complete structure. A newly concealed level may remain beyond what has unfolded.

This proposition is important to the entire study. The Matrix cannot be reduced to what is immediately visible. Visible unfolding reveals one level while potentially concealing others. The leaf reveals its veins, but not its entire internal biochemistry. Stone reveals layers, but not the complete history of pressure. A nebula reveals a luminous structure, but not all its physical parameters. An artefact reveals an image, but not its entire cultural semantics. Unfolding therefore always requires further analysis. Form opens, but is not exhausted.

Unfolding is also associated with direction. In a leaf, it frequently proceeds from the base and axis towards the edge. In a flower, it proceeds from the centre or bud towards the petal-like periphery. In geology, it proceeds from concealed layers towards the surface through a fault or outcrop. In culture, it proceeds from a central sign towards an ornamental or semantic periphery. Unfolding possesses a trajectory. It does not merely occur, but follows a particular path. Analysis of unfolding therefore requires the identification of direction: from where does the form unfold, towards what does it open, which boundaries does it overcome and which new edges does it create?

Unfolding is closely associated with the concept of an active periphery. While form remains folded, its periphery is frequently concealed. When form unfolds, the edge emerges and begins to operate. The leaf margin begins to interact with the external environment. The petal edge becomes a visible part of the flower. The geological edge of an outcrop reveals its layers. An ornamental edge completes a composition. The periphery appears as both a result and an indicator of unfolding. If the edge has not manifested itself, unfolding is incomplete.

In the A–B–C–D model, the fold and unfolding occupy a particular position. Stage A is potential wholeness. Stage B is the initial breaking of symmetry and the appearance of an axis. Stage C is folded and layered unfolding, the formation of facets, edges, segments and internal differences. Stage D is the unfolded form, in which the structure becomes manifest and relatively stable. The fold may nevertheless also remain present at stage D as a trace of development or a source of a further cycle. The fold is therefore not confined to a single stage; it is a mechanism of transition between stages.

It is especially important that unfolding does not eliminate the fold completely. Traces of earlier folding frequently remain in the unfolded form: lines, veins, curves, waves, ribs, seams, boundaries and layers. An unfolded leaf preserves its veins and sometimes traces of its folded state. An open flower preserves the lines of its petals and their superimposition. A geological fold remains within the relief. An architectural fold becomes a stable spatial form. Unfolding therefore does not erase the history of folded organisation, but makes it part of the manifest structure.

This makes it possible to formulate an important principle: form unfolds not as a pure plane, but as a surface possessing the memory of the fold. This is why real forms possess lines, waves, segments, edges, curves and inhomogeneities. Completely smooth unfolding would be an abstraction. Natural unfolding almost always preserves traces of stress, growth, compression, resistance and preceding states. The fold is therefore the internal memory of unfolded form.

In philosophical terms, fold and unfolding express the relationship between the concealed and the manifest. The concealed need not be mystical. It may simply be a hidden structure, invisible process, internal organisation or potential state. The manifest is form that has become accessible to perception, measurement and interaction. Morphogenesis is the transition

between them. The fold retains the concealed; unfolding makes it manifest. The Matrix describes the logic of this transition.

Manifestation does not, however, signify the ultimate truth of form. When a form unfolds, it reveals one level and simultaneously creates new internal regions. A leaf is unfolded, but its cells remain concealed. A flower is open, but its genetic and physiological organisation remains concealed. A rock fault is exposed, but the Earth's deep processes remain hidden. A symbol is read, but its historical layers may remain unclear. Every unfolding therefore generates new folds of knowledge. This makes the fold not only a morphological, but also an epistemological concept.

The fold as an epistemological concept means that knowledge of form likewise develops by revealing concealed levels. We see a contour, then discover a layer, followed by an internal structure, a process, a history and a connection with other forms. Research itself unfolds like a form. In this sense, the book on the Matrix also follows the logic of the fold: a general image is first presented, its levels are then unfolded, different domains are compared, and a more complex picture is subsequently formed.

The fold also helps to clarify the relationship between part and whole. Within a folded form, the part may conceal the whole, while the whole may be contained within the part. A seed contains the possibility of a plant. A bud contains a flower. A rolled leaf contains a future surface. A scroll contains a text. A folded map contains space. This relationship is important to fractal thought: the part is not equal to the whole, but may carry its principle. Unfolding demonstrates how the part becomes a means of access to the whole.

The image of a book or scroll is especially expressive in cultural terms. While a book remains closed, its text exists but is concealed. Opening the book makes its pages visible. Reading unfolds meaning successively. This is close to morphogenetic logic: content does not arise from nothing at the moment of reading, but becomes manifest only through unfolding. In the same way, the Matrix is not immediately visible; it unfolds through the analysis of forms, layers, edges, folds and cycles.

The fold also makes it possible to conceptualise the artefact. A bas-relief, stone surface, ancient sign, ornament or architectural fragment frequently possesses both physical and semantic folds: projections, indentations, lines, superimpositions, concealed levels, damage and historical traces. An artefact is not a flat bearer of an image. It preserves time within its material. Its surface may be read as a fold of culture: technique, symbol, historical period, the hand of the maker, ritual, damage and interpretation are folded within it. In the hypothesis of the Matrix, such forms will be important at the hermeneutic level.

When working with artefacts, however, it is especially important not to replace historical analysis with a morphological schema. Fold, edge, layer and facet may help to describe the form of an artefact, but they do not replace questions of culture, dating, function, material, technology or iconography. Here, the Matrix is a language of supplementary morphological interpretation rather than the sole explanation. This rule must be retained throughout the following chapters.

Fold and unfolding are also associated with the cycle. After complete unfolding, form may once again pass into a folded state or a new potential. A leaf emerges from a bud, unfolds, performs its function, then withers and becomes part of a new cycle of matter. A flower opens and subsequently becomes a fruit containing seeds. A cultural text unfolds through reading, then closes again and may be read anew. A geological structure is exposed, eroded and becomes material for new layers. Unfolding is not the final end; it forms part of a broader cycle.

It is here that the fold connects with the following section on complete unfolding and a new cycle. Completed form does not constitute the completion of the universe. It is a stage. An unfolded leaf may nourish a plant. An open flower may become a fruit. Exposed rock may erode and become sediment. An unfolded symbol may generate a new interpretation. Complete unfolding prepares new folding, a new seed and a new potentiality. The Matrix therefore possesses a cyclical structure: fold–unfolding–stabilisation–new folding.

The fold demonstrates that beginning and end are connected. At the beginning, form is folded as potential. At the end, unfolded form may once again create a folded potentiality. The seed is a fold of the future plant. The fruit is a fold of the future cycle. A book is a fold of meaning. A stone is a fold of geological time. In a broad morphological sense, a nebula may perhaps be described as a fold of future stellar processes. In each case, the fold connects past, present and future.

Thus, within the hypothesis of the Unified Matrix of the Universe, the fold is not a secondary detail, but one of the central mechanisms of form. It explains how a large structure may be contained within a small one, how a surface may be concealed within a volume, how the internal may become external, how a layer may bend, how an edge may become complex, how form may preserve the memory of a process and how unfolding may prepare a new cycle. The fold connects seed and leaf, potential and manifestation, enclosure and openness, internal and external.

Unfolding, in turn, is the process through which form becomes manifest. It translates concealed structure into visible organisation, activates the axis, surface, layer, facet and edge, introduces form into interaction with the environment and enables it to perform its function. Yet unfolding is never absolute or final. It preserves traces of the fold, reveals new levels of the concealed and becomes incorporated into a further cycle.

Form therefore does not appear from nothing. It unfolds from a folded, concealed, compressed or potential state. The fold is the morphological name for this state, while unfolding is the process of its manifestation. In leaf-like unfolding, the fold explains how the circle-seed becomes a surface, how concealed order becomes visible, how the boundary becomes an edge and how potential wholeness enters the space of development.

This is why the fold becomes one of the key concepts of the entire study. Without it, it is impossible to understand how the Matrix retains form before its manifestation and how it translates internal order into external structure. The fold demonstrates that the world of forms neither arises suddenly nor can be reduced to completed contours. It consists of processes of folding and unfolding in which every manifest form carries the memory of a concealed state and the possibility of a new beginning.

7.5. Complete Unfolding and a New Cycle

The complete unfolding of form is a crucial stage in the morphogenetic process, but it should not be understood as the absolute end of development. Within the hypothesis of the Unified Matrix of the Universe, a completed form always retains a dual status. On the one hand, it is the result of the preceding unfolding: the circle-seed has broken its initial symmetry, an axis has arisen, and layers, facets, edges, folds, rhythms, surfaces and peripheral structures have formed. On the other hand, the completed form may become the beginning of a new cycle, a new seed, a new potentiality and a new centre of future becoming.

This is precisely what distinguishes a morphogenetic model from a linear schema. If development is conceived solely in linear terms, form moves from beginning to end: seed–shoot–leaf–flower–fruit–completion. In real nature and within the logic of the Matrix, however, completion frequently returns the process to a new point of origin. The flower does not merely complete growth; it may develop into a fruit. The fruit does not merely complete the cycle; it contains seeds. The seed is not merely the result of a previous plant, but the beginning of a future one. The complete unfolding of form is therefore not a final halt, but a transition to a new potential whole.

This is especially clear in the biological cycle. The seed unfolds through the shoot, stem, leaves, bud, flower and fruit. The flower is one of the most expressive forms of unfolding: it displays a centre, radiality, layers of petals, an active edge, colour, scent, form and interaction with the environment. The flower, however, is not the plant's final word. Its function is associated with reproduction. The unfolded form creates the possibility of a new closed beginning. After flowering, the fruit arises, and the fruit contains seeds. The Matrix thus returns to the circle-seed, but only after the complete cycle of unfolding.

This return is not a simple repetition. The new seed is not identical to its predecessor. It continues the type, but enters a different context, environment and time. It may produce a new plant resembling the preceding one without being its copy. The Matrix's cycle should therefore be understood not as a closed circle of mechanical repetition, but as a spiral. Form returns to its initial potentiality, but at a new level, with new material, a new history and a new possibility of variation.

Nor is the complete unfolding of a leaf an absolute end. The leaf attains its developed form, expands its surface, reveals its venation, forms an edge and enters into exchange with the environment. Its existence, however, is incorporated into the broader cycle of the plant. It participates in photosynthesis, nourishment, respiration, transpiration, growth, the accumulation of matter and the maintenance of the life of the organism as a whole. The leaf may then age, change colour, fall, decompose, become part of the soil and participate in new natural processes. Even a completed leaf is not isolated from further becoming.

The unfolded form consequently performs two functions. The first is manifestation: it makes visible that which was concealed within the potential structure. The second is transition: it creates the conditions for continuation of the process. In the leaf, unfolding facilitates exchange. In the flower, it facilitates reproduction. In the fruit, it facilitates the return to the seed. In a geological layer, it enables further erosion, transport and accumulation. In a cultural symbol, it enables new interpretation. The completed form is simultaneously a result and a condition.

This proposition is fundamental to the hypothesis of the Unified Matrix of the Universe. The Matrix is not a schema of a single unfolding. It is cyclical. Its cyclicality, however, is not reducible to the repetition of a single figure. Every cycle includes unfolding, change, interaction with the environment, individualisation and a subsequent return to new potential. The Matrix may therefore be described through the sequence: potential wholeness–symmetry breaking–axial direction–layered and faceted differentiation–active edge–complete unfolding–reproduction–new potential wholeness.

Within the A–B–C–D model, complete unfolding corresponds to stage D. At this stage, form has become manifest. It possesses a recognisable structure, boundaries, internal organisation, function and relative stability. Stage D is not, however, an absolute conclusion. It may pass into a new stage A. The unfolded form may become the source of new potential. The flower becomes fruit and seed. Eroded rock becomes the material of new strata. Cosmic matter may participate

in subsequent structures. A cultural image may become the basis of a new composition, myth, architectural motif or interpretation.

This transition from D to A is one of the most important moments in the hypothesis. It demonstrates that the Matrix not only unfolds form, but also folds the result back into potential. That which was manifest may become concealed once again. That which was peripheral may become a new centre. That which formed part of a completed structure may become the beginning of an independent process. The seed is part of a plant, but becomes the beginning of a new plant. A fragment of rock is part of a mass, but may become material for a new geological layer. A symbol is part of a culture, but may become the centre of a new system of meanings.

The fractal logic of the Matrix is manifested especially clearly here. A part may become a new whole. That which is complete may become initial. The peripheral may become central. The small may contain the possibility of the large. A branch may become an axis for new branches. A vein may become the centre of a smaller network. A tributary may form the basis of its own basin. A fragment of an image may become a motif within a new ornament. A seed may become a future tree. A new cycle therefore does not begin in an external emptiness; it arises from the result of a preceding unfolding.

Complete unfolding is also associated with the maturity of form. A mature form is not merely large or fully visible. It is a form in which the principal elements of the Matrix have attained functional or structural coordination. The axis maintains direction, the layers are organised, the facets are connected, the edge is active, internal structure interacts with the external environment, and the form is capable either of performing its function or of passing into a new cycle. Maturity signifies not immobility, but the completeness of a given stage.

In biology, maturity is especially evident. A leaf becomes mature when its surface has unfolded and is capable of performing its exchange functions. A flower is mature when its structure is prepared for reproductive interaction. A fruit is mature when it is capable of transmitting seeds. Maturity does not, however, imply immortality. On the contrary, it is frequently a transitional moment preceding transformation. A completely unfolded form already contains the beginning of future change. The flower withers, the fruit ripens, the seed separates and the leaf ages. Completion becomes a condition of transition.

In geology, the concept of complete unfolding possesses a different meaning. A geological form may be revealed through exposure, faulting, erosion, sectioning, uplift or destruction. A rock stratum becomes visible at the surface. A fold is revealed in a mountain mass. A crack reveals internal stress. A river network reveals the structure of the relief. Here too, however, exposure is not the end. Exposed rock undergoes further weathering. Eroded material is transported by water or wind. Sediments accumulate in new places. A new stratum may become part of a future rock. Geological form is likewise incorporated into a cycle, although this cycle is far slower than a biological one.

In geology, therefore, completed form is frequently a temporary fixation of a process. A mountain, coast, stratum, stone, crack, canyon or river network appears stable, yet continues to change. Its unfolding through time is slower than human perception, which makes it appear motionless. From the perspective of the Matrix, however, these forms likewise pass through stages: accumulation, pressure, deformation, exposure, destruction, transport and new accumulation. Here too, D may pass into A, but through geological duration.

In cosmic structures, the full cycle is still more extensive and requires particular caution. A nebula, stellar cloud, shell, galactic structure or star-forming region is not a biological form and does not reproduce like a plant. In a broad morphological sense, however, a cosmic form may likewise be incorporated into processes of material transformation. Gas clouds may contract, stars may arise and complete their developmental stages, ejected matter may participate in new structures, and galaxies may interact and become transformed. Here, the new cycle is not seed-based in the biological sense, but may be understood as the transition of matter and structure into new states.

When analysing the cosmos, biological cyclicality must not be transferred literally. A nebula cannot be said to 'produce a seed' in the same sense as a plant. It may, however, be said that an unfolded cosmic structure can become part of a further process of structuring matter. In this sense, the cosmic transition from D to A is transformational rather than reproductive. A completed or manifest structure does not disappear without trace; its matter, energy, waves, shells and distributions become incorporated into new processes.

The complete cycle of unfolding has a different character again In culture. A symbol, artefact, ornament, architectural form or text unfolds through perception, interpretation and incorporation into tradition. A cultural form may be complete as a work, but incomplete as a source of meaning. A single symbol may generate new images, rituals, texts, architectural forms and philosophical interpretations. The completed form becomes a seed of culture. It folds semantic potential within itself, which may be unfolded again at another time.

This is especially important when working with ancient artefacts and symbolic systems. A bas-relief, mandala, World Tree, ornament, sacred geometry or architectural schema may be complete as a material or visual form, while its semantic life continues. Such forms pass from culture to culture and from one historical period to another, from image to interpretation and from symbol to philosophical model. In this sense, cultural form demonstrates a hermeneutic cycle of the Matrix: the image unfolds and is then folded back into a sign that may be opened through a new reading.

The cultural cycle should not, however, replace the natural one. A biological seed, geological sediment, cosmic matter and cultural symbol possess different forms of continuation. They cannot be reduced to a single mechanism. At the level of a meta-theoretical language, however, it may be said that in every case, completed form is not necessarily the end. It may become a condition of the next form. It is this structural function that matters to the hypothesis.

The complete unfolding of form is also associated with the active periphery. When form reaches the unfolded state, its edge, surface and boundaries become maximally involved in interaction. The leaf is open to light and air. The flower is open to pollination and its environment. The coastline is exposed to the action of water. An exposed stratum is open to erosion. A nebular shell is open to interaction with the surrounding interstellar medium. Architectural form is open to human perception and movement. A symbol is open to interpretation. Unfolded form is always more active and more vulnerable than enclosed form.

Complete unfolding therefore has a cost. The circle-seed is protected, but concealed. The leaf is unfolded, but vulnerable. The bud protects the flower, but once the flower opens, it enters into a hazardous interaction with the world. A geological layer is protected by overlying rock while it remains concealed; once exposed, it becomes subject to erosion. While a symbol remains enclosed within a tradition, it retains its integrity; through interpretation, it may be transformed,

understood differently or incorporated into a new context. Unfolding opens form both to possibilities and to external influence.

This explains why the development of form cannot be conceived as unequivocal perfection. Unfolding allows complete manifestation, but does not eliminate finitude. On the contrary, it makes form part of further processes of change. A fully unfolded leaf will begin to age. After opening, a flower will proceed to withering and fruiting. Exposed rock will be eroded. An architectural form will age and be reinterpreted. Unfolding is a moment of maximum manifestation, but not an eternal halt. It already contains a future transition.

Within the hypothesis of the Matrix, this may be described as the law of reverse folding. The unfolded form gradually returns to a state of potentiality, although not necessarily within the same material or by the same means. Biological form returns to the seed. Geological form returns to sediment, fragment or new stratum. Cosmic form returns to the redistribution of matter. Cultural form returns to sign, text, memory or motif. Unfolding passes into new folding, and new folding may become the beginning of another unfolding.

The cyclical logic of the Matrix thus arises: folded–unfolded–folded anew; potential–manifest–new potential; centre–periphery–new centre; seed–leaf–flower–fruit–seed; layer–exposure–erosion–new layer; symbol–interpretation–new symbol. This logic is not mechanically identical in all systems, but it expresses a general morphogenetic principle: form not only arises, but also transmits the possibility of further form generation.

It is especially important that the new cycle does not erase the preceding one. It carries its memory. A seed is connected with the plant that produced it. Sediment is connected with the rock from which it originated. A new cultural motif is connected with an earlier symbol. Even when this connection is not immediately visible, it may be reconstructed through analysis of form, material, structure and context. The Matrix is therefore not merely a cycle, but a cycle with memory. Every new turn bears the trace of the preceding one.

The image of the spiral arises once again here. The circle expresses return, while the spiral expresses return accompanied by the accumulation of difference. Within the hypothesis of the Unified Matrix of the Universe, the full cycle should not be represented as a flat circumference along which everything returns to the same point. The spiral cycle is a more precise model: form returns to potentiality, but that potentiality is already incorporated into a new history. The seed of a new plant is not the previous seed; a new stratum is not the old one; a new interpretation is not the previous meaning. The cycle preserves the principle while changing its particular realisation.

Complete unfolding is also associated with the richness of form. At the stage of complete unfolding, the elements of the Matrix attain their greatest visibility. In a leaf, the axis, veins, surface, edge, segments and sometimes folds and waves are visible. In a flower, the centre, radiality, petals, layers, periphery, colour and rhythm are visible. In a geological section, strata, folds, cracks, boundaries and texture are visible. In a nebula, shells, filaments, edges and regions of brightness are visible. In an artefact, composition, axes, levels, ornament and symbolic elements are visible. Complete unfolding makes form analytically accessible.

Precisely because form becomes maximally visible, however, there is a danger that it will be taken for the final truth. The visible state appears complete, but constitutes only one moment of a process. A flower is beautiful at the moment of opening, but its morphogenetic meaning is broader: it is associated with the seed, fruit and cycle. A section of rock is expressive, but it is the trace of an extensive geological history. A nebula is impressive, but its form is a dynamic stage.

An artefact may be complete, but its semantic life continues. Complete unfolding must therefore be analysed not as a static image, but as a phase.

In this sense, every unfolded form possesses three temporal dimensions. The first is the past that led to its emergence: the seed, fold, pressure, growth or concealed structure. The second is the present in which it is manifested: the leaf, flower, layer, edge, nebula or symbol. The third is the future in which it becomes a condition of a new process: a seed, erosion, transformation, interpretation or new form. Complete unfolding occupies the centre of this temporal triad. It connects memory and possibility.

This is especially important to understanding the Matrix as a processual rather than static model. The Matrix is not merely a set of formal characteristics. It describes transitions between states. Circle-seed, axis, layer, facet, edge, fold, unfolding and new cycle are not isolated elements, but phases of a single process. Complete unfolding occupies a culminating position within this process, but does not eliminate the next transition. It is the culmination of a given cycle and the beginning of preparation for the next.

In the biological model, the sequence may be represented as follows: the seed as concealed potentiality; germination as symmetry breaking; the shoot as an axis; the leaf as an unfolded plane; the bud as a new closed form; the flower as radial unfolding; the fruit as the folding of the result; and the seed as a new cycle. This sequence demonstrates that phases of folding and unfolding may alternate within a single life process. The Matrix operates not once, but repeatedly, creating nested cycles.

The leaf and flower represent different types of unfolding within this sequence. The leaf unfolds an axial–planar structure. The flower unfolds a centred, radial structure. The fruit gathers potential once again within a closed form. The plant therefore demonstrates several models of the Matrix: the circle-seed, axis-shoot, leaf-like unfolding, radial floral unfolding and fruit–seed cycle. This makes plant morphogenesis especially important material for the hypothesis. It clearly demonstrates transitions that may subsequently be compared cautiously with other domains.

In geology, a comparable sequence will be less evident and far slower. Concealed stress or the accumulation of matter corresponds to a potential phase. Deformation, cracking or flow corresponds to the beginning of a disturbance of equilibrium. Layering, folding, relief, a river network or a coastline corresponds to unfolded form. Erosion, transport and sedimentation correspond to the transition to a new cycle. There is no biological seed here, but there is a morphological logic: concealed state, manifestation, unfolding, destruction and new structural possibility.

In the cosmos, one may likewise speak of stages, but without biological reduction. A cloud of matter, a region of concentration or an initial inhomogeneity may be regarded as a potential state. Gravitational instability, rotation, ejection, a shock wave or expansion may be regarded as the beginning of unfolding. A nebula, stellar region, shell or galactic structure may be regarded as a manifest form. Further transformation of matter may be regarded as a transition to new states. This is not a ‘seed’ cycle in the biological sense, but a cycle of structural transformations.

In culture, complete unfolding is particularly associated with the act of perception. A symbol may have been created and materially completed, yet unfolds only within cultural understanding. An artefact becomes a form of meaning when it is incorporated into interpretation. Architecture unfolds through human movement in space. Ornament unfolds through the gaze, rhythm and

repetition. Text unfolds through reading. Cultural unfolding is therefore always associated not only with the object, but also with the perceiving subject. This distinguishes it from natural forms and requires particular hermeneutic caution.

The complete unfolding of a cultural form may also generate a new cycle. A text that has been read becomes the source of another text. A symbol that has been seen becomes a motif for a new image. An architectural type becomes the basis of new buildings. An ornamental element is repeated, modified and transferred into another tradition. A bas-relief becomes an object of research and a source of new meaning. Culture thus reproduces forms not biologically, but through memory, imitation, interpretation and creative transformation.

In this respect, the Matrix may be understood as a general logic not only of the natural, but also of the cultural continuation of form. Nature continues form through material processes, growth, destruction, transport and transformation. Culture continues form through sign, image, technique, memory, text, ritual and architecture. These modes of continuation differ, but both demonstrate that an unfolded form is capable of becoming the source of a new form. It is this capacity that connects completion with beginning.

The concept of the ‘new seed’ is of particular significance. In biology, it is literal. In a philosophical and morphological sense, a new seed may signify any state in which the result of a preceding cycle is folded back into potential. A fragment of stone may become new material. An image may become a motif. An idea may become a theory. A symbol may become a cultural programme. Cosmic matter may enter a new structure. Within the hypothesis, the ‘seed’ therefore possesses two levels: the biological and the universally morphological. They must be distinguished, but the second level makes it possible to describe transitions between cycles in different domains.

Complete unfolding also raises the question of the limit of form. When may a form be said to have unfolded completely? In biology, this may be associated with functional maturity. In geology, with the manifestation of a structure at the surface or in section. In culture, with the completion of a composition or its interpretation. In the cosmos, with an observable stage of a structure. ‘Complete’ unfolding, however, is always relative. It is complete for a given stage, function, scale or observer. At another scale or at a later time, form may prove to be only partially unfolded.

A leaf, for example, may be completely unfolded as an organ of a plant, while its microstructure requires further analysis. A flower may be fully open externally, while its reproductive process continues. A geological stratum may be visible in an outcrop, while its complete history requires laboratory and field investigation. A nebula may be visually unfolded in an image, while its physical parameters require spectral analysis. A symbol may be visible, while its semantic layers unfold gradually. Complete unfolding therefore does not eliminate the need for further knowledge.

This proposition protects the hypothesis from excessive simplification. A form cannot be assumed to have been understood merely because it is visible. Visibility is the beginning of analysis, not its conclusion. Complete unfolding in the morphological sense means that form has manifested its structure at a particular level. Other levels may nevertheless lie beyond it. The Matrix therefore requires a multilayered reading: visible contour, internal structure, process, history, function, context and new cycle.

Complete unfolding is also associated with aesthetic experience. A flower at the moment of opening, a leaf in its mature form, mountainous relief, a section of stone, a nebula, mandala, architectural dome or ornament frequently produces a powerful impression precisely because it

reveals organised fullness. We perceive not merely individual elements, but the coordination of centre, axis, layers, edges, rhythms, proportions and variations. The aesthetic force of unfolded form may be the first indication of its internal organisation. As before, however, aesthetic impression must be developed into morphological analysis.

Within the hypothesis of the Matrix, the beauty of unfolded form may be understood as the experience of manifest order. This does not mean that every beautiful form confirms the hypothesis. Many natural and cultural forms appear expressive, however, because concealed order has become visible: a bud has unfolded into a flower, a layer has emerged at the surface, a cloud has become a nebula, or a symbol has unfolded into a composition. Beauty is associated here with the moment of manifestation. Form reveals its internal logic, and this logic is perceived as wholeness.

An unfolded form may, however, be dramatic as well as harmonious. A fault, crack, eroded coast, folded rock, explosive nebula or damaged artefact likewise represents a form of unfolding. Such forms may not be ‘beautiful’ in the conventional sense, but they are morphologically expressive. They demonstrate tension, rupture, the memory of force and the transition of matter. The Matrix must therefore analyse not only harmonious unfolding, but also unfolding through crisis. Form may manifest itself through growth, but also through destruction.

This is especially important to the universality of the hypothesis. If only flowers, leaves and symmetrical forms are considered, the Matrix will appear excessively gentle and decorative. The world, however, contains faults, cracks, destruction, asymmetries, irregular edges and deformations. These phenomena also participate in form generation. A completed form may arise through stress, and a new cycle through the disintegration of an earlier structure. Complete unfolding must therefore include not only flourishing, but also exposure, rupture and transformation.

In this sense, the complete cycle of the Matrix possesses two aspects: generative and transformational. The generative aspect is visible in growth, unfolding, flowering and the formation of structure. The transformational aspect is visible in ageing, destruction, disintegration, transport and reinterpretation. The two are nevertheless connected. Without generation, there is no form; without transformation, there is no new cycle. A seed becomes a plant, and the plant creates a seed; rock is eroded and creates sediment; a symbol is interpreted and gives rise to a new symbol. The Matrix does not arrest the world in completed form, but describes its continuous becoming.

Complete unfolding also helps to clarify the role of the environment. At the early stages, the environment initiates development and influences its direction. At the stage of unfolding, the environment becomes the principal partner of form. The leaf unfolds towards light, the flower towards pollinators and air, the coast towards water, stone towards wind and temperature, a nebula towards the surrounding interstellar medium, architecture towards human beings and the city, and a symbol towards culture. An unfolded form does not exist by itself. It is intended for interaction or inevitably becomes involved in it.

The complete cycle of the Matrix cannot therefore be conceived as an internal process without an external world. Internal potential unfolds only through the environment and returns to new potential likewise through the environment. A seed requires soil and water. A leaf requires light and air. A fruit requires dispersal. Sediment requires transport. A symbol requires memory and interpretation. The environment does not merely surround form, but participates in its cycle. The Matrix is realised as a relationship between the internal and external.

Complete unfolding is also the moment at which the parts become maximally distinguishable. Within the seed, they are concealed. Within the fold, they are superimposed. Within the unfolded form, they become distinguishable: axis, layer, facet, edge, centre, periphery, network and segment. This makes the unfolded form convenient for analysis. It must nevertheless be remembered that the distinguishability of parts does not imply the disintegration of the whole. On the contrary, complete unfolding demonstrates how the parts work together. A fully unfolded form is one in which differences are coordinated.

In a leaf, the veins, surface and edge form a whole. In a flower, the centre, petals, layers and periphery operate as a unified structure. In a geological section, layers, folds and cracks form the history of the rock mass. In architecture, axis, volume, façade, edge and internal space form a composition. In a symbol, centre, radiality, periphery and ornament create a semantic field. Unfolding is therefore not only the differentiation of parts, but also the revelation of their connection.

It is the connection between parts that allows a completed form to become a new seed. If the parts have disintegrated without retaining any connection, a new cycle may not arise or may take a different form. If form preserves its structural principle, however, that principle may be transmitted. The seed transmits the principle of the plant. Sediment carries the material and traces of previous rock. A symbol transmits a compositional and semantic schema. An architectural type transmits a spatial principle. The new cycle therefore depends upon what is preserved after unfolding and transformation.

Within the hypothesis of the Unified Matrix of the Universe, this may be called the transmission of a morphogenetic invariant. Not every detail is repeated, but the principle is preserved: centred organisation, axis, branching, layering, edge, self-similarity and cycle. What passes from one cycle to another is not necessarily the same material or form, but structural possibilities. The Matrix is therefore not copying, but the reproduction of a principle. This is especially important to understanding universality: it is not the object that recurs, but the mode of organisation.

In concluding this chapter, it must be emphasised that leaf-like unfolding represents only one of the major stages of the hypothesis. It demonstrates how form unfolds from a potential state into an organised surface possessing an axis, layers, facets, folds and an active edge. The complete cycle, however, requires a return to new potentiality. If the analysis ends with unfolding, the Matrix remains incomplete. Its meaning becomes fully apparent only when the unfolded form once again becomes the source of a future form.

Complete unfolding and the new cycle therefore constitute the concluding pair within the model of leaf-like development. Complete unfolding makes form visible, functional, interactive and analytically accessible. The new cycle demonstrates that this form does not disappear into completion, but transmits its potential onwards. In biology, this is the seed; in geology, a new layer or material; in the cosmos, a new transformation of matter; and in culture, a new sign, motif or interpretation. Different mechanisms preserve a single morphological principle: completion becomes beginning.

The development of form within the hypothesis of the Unified Matrix of the Universe may thus be understood as movement from the circle-seed to leaf-like unfolding and onwards to a new cycle. The leaf has demonstrated a universal model of the unfolded plane; layer, facet and edge, the internal differentiation of that plane; the serrated and undulating edge, the activity of the periphery; the fold, the mechanism of transition from the concealed to the manifest; and complete unfolding, the culmination of form and its capacity to become a new beginning. The

Matrix thus appears not as a static schema, but as a cycle of folding, unfolding, interaction and reproduction.

This chapter prepares the transition to the next level of analysis: the fractal repetition of structure and the manner in which unfolded form begins to reproduce its principle in parts, modules, branches, layers, edges and new centres. If the circle-seed establishes the beginning and leaf-like unfolding demonstrates its manifestation, the subsequent discussion must demonstrate how unfolded form becomes self-similar, multiscale and capable of reproducing its invariants.

Chapter Eight

The A–B–C–D Model as a Schema of the Morphogenetic Process

8.1. Stage A: The Closed Seed

Within the hypothesis of the Unified Matrix of the Universe, the A–B–C–D model is intended to describe the morphogenetic process not as a collection of disparate images, but as a sequence of stages. The preceding chapters considered the circle-seed, the closed form, symmetry breaking, leaf-like unfolding, the layer, facet, edge, fold and new cycle. These elements must now be brought together within a single schema. Stage A is the first phase of this schema. It denotes the closed seed—a state of maximum concentration of form, latent order and minimal external differentiation.

Stage A is not an empty beginning. This is a point of fundamental importance. Within the Matrix hypothesis, the beginning of form is not understood as absolute nothingness, structureless chaos or an indeterminate mass upon which order is subsequently imposed from outside. On the contrary, Stage A represents a state of compressed potentiality. The form has not yet unfolded, but it already contains the possibility of future unfolding. It does not yet possess a visible axis, layers, branching, an active edge or a fully developed periphery, yet its internal order is already present as a latent organisation.

The image of the closed seed expresses this stage most clearly. A seed is small, compact, protected by a coat and relatively simple in outward appearance. It does not display the full future complexity of the plant. It has no visible trunk, leaves, branches, flowers or fruit. Yet it is the vehicle of future morphogenesis. It contains the possibility of growth, axial unfolding, branching, leaf formation, flowering and reproduction. The closed seed is therefore not the absence of form, but form prior to its manifestation.

Stage A may be defined as the state in which form is gathered within itself to the greatest possible degree. Its energy, structure and potential have not yet been distributed through space. It holds future multiplicity, as it were, within unity. In this sense, Stage A corresponds to the circular, seminal, embryonic or nuclear phase of the Matrix. Here the whole still precedes the parts. The future elements have not been separated from one another, but their potential is already contained within the original whole.

External differentiation is minimal at Stage A. This means that the observer cannot yet see a complex structure. The surface may be smooth, shell-like, rounded, oval, compact, closed or almost homogeneous. The absence of external complexity, however, does not imply the absence of internal organisation. It is precisely this distinction that makes Stage A methodologically difficult: it cannot be assessed solely by its outward appearance. Its latent potential, internal structure, threshold conditions and capacity for unfolding must also be taken into account.

Stage A is a state of concentration. Here concentration means not only the density of matter, but also the gathering together of possibilities. In a biological seed, this is expressed literally: a small

object contains the beginning of a future organism. In a bud, the future flower is gathered within a closed form. In an egg, development is enclosed within a shell. In a leaf bud, the future leaf or shoot remains in a protected, folded state. In each case, the future form does not yet occupy its full spatial extent, but is already associated with an internal order.

In a broader morphological sense, Stage A may have analogues beyond biology. In crystallisation, it may be a growth nucleus around which the ordering of matter will begin. In geology, it may be a zone of latent stress, an inclusion, an incipient fracture, a compact concretion or an initial centre of pressure or accumulation. In cosmic processes, it may be a region of concentrated matter, an initial inhomogeneity, a gas condensation or the source of future expansion or gravitational organisation. In culture, it may be an originating sign, a circle, a central point, a closed compositional schema or the sacred core of an image. These forms are not seeds in the biological sense, but they may perform a similar morphological function: they may constitute the beginning of a possible unfolding.

Stage A should therefore be understood as a functional rather than merely object-based category. The closed seed is not only the actual seed of a plant. It is a model of any state in which the future form remains latent but is already prepared. Four features are important at this stage: the presence of a boundary, the presence of internal order, minimal external differentiation and the capacity for transition. If an object is simply closed but contains no potential for unfolding, it does not constitute a fully developed Stage A. If it is already fully unfolded, it belongs to a later stage. Stage A is specifically closed potentiality.

At Stage A, the boundary performs protective and organising functions. The seed coat, the surface of an egg, the closed condition of a bud, the circumference of a circle, the boundary of a crystallisation nucleus and the outer shell of a compact formation are all forms of containment. The boundary separates the inside from the outside, preserves the potential and prevents the internal organisation from dispersing prematurely. At Stage A, the boundary has not yet become an active edge in the full sense. It is primarily a shell. Its task is to preserve, protect, contain and prepare.

This boundary is not, however, an absolute wall. If it remains permanently impermeable, development cannot begin. Stage A therefore contains an internal contradiction: the form must be closed in order to preserve its potential, but not so closed as to preclude unfolding. A seed must be protected, but capable of germination. A bud must hold its petals together, but subsequently open. A crystallisation nucleus must possess internal order, but be capable of growing beyond its original region. A symbolic circle must delimit an internal space, but may subsequently unfold through axes, lines, ornament or interpretation.

In this sense, Stage A is not lifeless immobility but a state of tense equilibrium. The form has not yet unfolded, but it already contains the possibility of disturbing this equilibrium. It is at rest, yet this rest is potentially dynamic. Such repose may be termed morphogenetic repose. It differs from the absence of a process in that, when conditions change, it is capable of passing into development. A seed may remain dormant for a long time, but when sufficient moisture, temperature and oxygen are available, it enters the phase of germination. The internal structure awaits a threshold.

Threshold conditions are among the principal features of Stage A. The transition to the next stage does not occur arbitrarily. It requires particular conditions. In biology, these are the conditions required for germination or opening. In geology, they may include the attainment of a critical level of stress, pressure, temperature, moisture, erosive action or mechanical force. In the cosmos,

they may include changes in density, gravitational instability, an energetic event or the interaction of gas and radiation. In culture, they may take the form of an act of reading, ritual, use or interpretation, or the placement of a form within a new context. Stage A preserves potential until the moment of transition.

Stage A, therefore, is not simply the 'first image' in a process. It is a phase in which conditions accumulate. It cannot be understood without the future Stage B, because the meaning of the closed seed becomes apparent only through the possibility of its first unfolding. Yet Stage B cannot be understood without A, because the first unfolding must have a latent precondition. The morphogenetic process begins not with external movement, but with internal preparedness.

Symmetry plays a particular role at Stage A. The circle-seed expresses a state in which directions are still relatively equivalent. There is no explicit axis, developed periphery or branching. Such symmetry need not be geometrically perfect, but it signifies the absence of pronounced external differentiation. The form is gathered around itself, as it were. It has not yet selected a direction of unfolding, or has not yet manifested one. Stage A is therefore associated with a potentiality in equilibrium.

A latent polarity may, however, already exist within this symmetry. A seed may possess the future root and shoot. A bud may have a base, an apex and a concealed radial organisation. An egg may possess an internal axis of development. A crystallisation nucleus may contain directions of future growth. Geological stress may have a latent orientation. A gas cloud may contain inhomogeneities of density. Stage A is therefore not a state of absolute homogeneity. Rather, it is a state in which differences have not yet become externally manifest.

This distinction between external symmetry and internal polarity is especially important. If everything at Stage A were absolutely homogeneous, the transition to development would be inexplicable. If, however, latent differences, gradients, stresses or directions already exist within it, Stage B becomes a logical next step. The first unfolding does not arise from nothing; it manifests what has been prepared internally. Stage A is therefore the latent basis of asymmetry.

In biological terms, Stage A is associated with embryonic potential. A seed is not a miniature completed plant, but it contains the conditions required for the development of a plant. This helps to avoid the naïve conception of the Matrix as a pre-drawn blueprint. At Stage A, the future form is not present as a completed miniature. It is present as a programme of possibilities, a range of unfolding and an internal organisation capable of interacting with the environment. Stage A is therefore not a copy of the future, but its morphogenetic potential.

Stage A may be less evident in geological material, because geological forms often become visible only after a lengthy process. If their genesis is considered, however, potential states can be identified: the accumulation of sediment before a stratum forms, latent pressure before folding, a microfracture before a major fault, a mineral nucleus before crystal growth, or subterranean movement before emergence at the surface. These states do not always have the form of a seed, but they fulfil a seminal function: they constitute the beginning of a future structural event.

Before a fracture becomes manifest, for example, it may exist as a zone of stress. Externally, the material is still intact. Its internal structure, however, already contains the possibility of rupture. When the stress reaches a threshold, a fracture line appears. This is the transition from Stage A to Stage B. In geology, therefore, Stage A may be a latent phase of stressed integrity. It is not visible as a form, but will manifest itself through subsequent deformation.

In the cosmos, Stage A must likewise be understood morphologically rather than literally. An initial inhomogeneity, a region of concentrated gas, a dense cloud, a centre of future star formation or a gravitational node may all be considered potential states. There is no biological seed coat here, but there is a concentration of matter, latent dynamics and the possibility of future unfolding. The cosmic form of Stage A makes it particularly clear that the Matrix describes not a specific biological mechanism, but a structural situation: concentration prior to unfolding.

In cultural and symbolic systems, Stage A may be manifested as a point, a circle, a closed sign, a central symbol, the core of a composition, an unelaborated myth, a scroll, a closed book or a sacred centre. These forms contain semantic potential. They may be outwardly simple but inwardly saturated with cultural meanings. It is necessary, however, to bear the distinction between levels in mind: cultural Stage A is not physical morphogenesis. It belongs to the hermeneutic and symbolic level. Nevertheless, it may be described using the same morphological language: closure, centre, potentiality, boundary and the future possibility of unfolding.

Stage A is also associated with the concept of minimal external information. An observer who sees only the closed seed cannot fully reconstruct its future form without knowledge of the context. The same applies to a bud, an egg, a crystallisation nucleus, a closed symbol or a latent geological structure. Stage A always contains more than it displays. It requires interpretation, knowledge of processes and an understanding that visible simplicity may be folded complexity. An analysis of Stage A cannot therefore be confined to external description.

This makes Stage A especially important to the methodology of the hypothesis. Many errors arise when a closed form is either underestimated or mystified. Underestimation consists in treating it as a simple, empty shell. Mystification consists in declaring it to be a mysterious essence without analysing its concrete structure. The correct approach must take a third path: Stage A should be regarded as a potential structure whose internal organisation must be identified through scientific, morphological or hermeneutic investigation, depending on the type of object.

Within the Matrix, Stage A may be described through several basic parameters.

The first parameter is the degree of closure. To what extent is the form separated from its external environment?

The second is the degree of concentration. To what extent is the future structure gathered within a small or compact state?

The third is the presence of internal order. Can latent elements, gradients, stresses, layers or polarity be identified?

The fourth is the threshold of unfolding. What conditions are required for the form to pass to Stage B?

The fifth is the direction of potential unfolding. Are there signs of a future axis, radiality, branching or layering?

These parameters make Stage A a working category rather than merely an image. A biological seed, for example, exhibits a high degree of closure and concentration, pronounced internal organisation and clearly defined conditions of germination. A bud possesses latent layering and radiality. A crystallisation nucleus contains an initial order of growth. A geological stress zone possesses latent polarity and a threshold of rupture. A symbolic circle has a boundary, a centre

and the possibility of compositional unfolding. Comparison by means of these parameters helps to avoid arbitrary analogies.

Stage A is also a phase of preservation. Not every potential must unfold immediately. Under some conditions, preservation is more important than development. A seed may wait out an unfavourable period. A bud may await the appropriate season. A geological structure may retain stress for a long time. A cultural sign may be preserved within a tradition until it is reinterpreted. Stage A therefore possesses a value of its own. It is not merely a state that 'has not yet unfolded'; it performs the function of maintaining possibility.

This maintenance is particularly important within the cyclical logic of the Matrix. After Stage D, a completed form may return to a new A. The new A, however, must preserve not the full complexity of the preceding cycle in its unfolded state, but its principle in a folded state. A seed does not contain a tree as a completed volume; it preserves the possibility of the tree. A new cultural motif does not contain the entirety of an earlier tradition; it preserves its structural core. New geological material does not literally reproduce the previous rock; it contains the conditions for a new formation. Stage A is therefore a form of transmitting a principle through compression.

In this sense, A is not only a beginning, but also the result of a previous cycle. A seed is the beginning of a new plant, but it is also the product of an earlier plant. Sediment may be the beginning of future rock, but it arose through the destruction of earlier rock. A symbol may become the beginning of a new interpretation, but it emerges from an earlier cultural history. Stage A is thus always dual: it is a beginning in relation to the future and an outcome in relation to the past. This duality makes the A–B–C–D model cyclical rather than linear.

Stage A is also associated with the concept of memory. The closed seed carries the memory of its type. Geological material carries the memory of preceding processes. A cultural sign carries the memory of tradition. Cosmic matter carries the history of previous states. In every case, the new beginning is not absolutely new. It bears the trace of what preceded it. Yet this trace is folded, compressed and not fully visible. Stage A is therefore memory in a state of potentiality. It preserves the past as a possibility for the future.

This proposition clarifies the phrase 'closed seed' in the title of this section. Closure does not mean isolation from history. On the contrary, the seed is closed precisely because it must preserve accumulated potential. It is not cut off from the past; it concentrates it. It is not cut off from the future; it opens the way towards it. Stage A is therefore a nexus of time: the past is compressed within it, the future is possible through it, and the present holds it in a state of readiness.

Philosophically, Stage A expresses the category of the possible. Here the possible is not fantasy or arbitrary indeterminacy. It is a structurally conditioned possibility. A seed may become a plant of a particular type, but it cannot become just anything. A bud may open into a flower, but not into a stone. A crystallisation nucleus may generate a particular type of growth. Geological stress may be released along particular lines. A symbol may unfold within a cultural field. The possibility embodied in Stage A is always limited by its internal order and external conditions.

Stage A therefore differs from chaos. Chaos, in the strict sense, may contain many indeterminate states, whereas Stage A already possesses directed potential. It is not unfolded, but neither is it arbitrary. It is latent, but not devoid of content. It may be externally symmetrical while internally polar. It is compact, but capable of expansion. It is closed, but prepared for transition. These oppositions create the tension inherent in Stage A.

It may be said that Stage A contains form in the mode of ‘not yet’. This ‘not yet’ is not an absence. It is future form held in abeyance until its time arrives. The leaf does not yet exist, but the possibility of the leaf does. The flower does not yet exist, but the bud does. The fracture does not yet exist, but the stress does. The composition has not yet unfolded, but the centre is present. The full structure does not yet exist, but its initial organisation does. Stage A is form prior to manifestation, but not prior to being.

This approach is of major importance to the hypothesis as a whole. It makes it possible to speak of the Matrix as a process in which visible form arises from latent order. If Stage A is taken seriously, the subsequent stages no longer appear to be the random emergence of structure. They become the unfolding of what has been prepared. This does not, however, mean that the result is entirely predetermined. Between A and D lie the environment, interaction, thresholds, asymmetry, branching, random deviations, stresses and variability. A therefore establishes a potential, but does not dictate every detail.

Stage A is also important to an understanding of the universality of the Matrix. In many systems, a state of concentration before unfolding can be identified: a biological seed, geological stress, a crystallisation nucleus, cosmic condensation or a cultural centre. If these states possess different mechanisms but a similar morphological function, this supports the idea of a meta-theoretical language. The Matrix does not assert that all these states are identical. It asserts that they may be compared as different variants of an initial potential structure.

The limits of applicability must nevertheless be taken into account. Not every closed form constitutes Stage A. A randomly enclosed object without an internal potential for unfolding, for example, has no full morphogenetic significance. Not every circle is a seed. Not every point is the centre of future development. Compactness does not always imply potential. Stage A therefore requires criteria. The key criterion is the capacity for transition. If a closed form does not lead to B, it may simply be a completed structure rather than the beginning of morphogenesis.

This distinction is especially important in cultural analysis. A circle in an ornament may be an independent symbol of completion, or it may be the centre of a larger composition. A closed sign may be a decorative element or a semantic core. In order to identify it as Stage A, it must be shown that it actually participates in an unfolding: that axes, rays, layers, ornamental fields, levels of meaning or interpretative connections emerge from it. Otherwise, it remains merely a circular form rather than a morphogenetic beginning.

Criteria must be equally rigorous in the analysis of natural forms. A seed clearly constitutes Stage A because it actually passes into growth. A bud does so because it opens into a flower. A crystallisation nucleus qualifies if it constitutes the beginning of crystal growth. A geological stress zone qualifies if it is connected with a subsequent fault or deformation. A cosmic condensation qualifies if it participates in the subsequent structuring of matter. Without a connection to a process, Stage A cannot be identified with confidence.

Stage A must therefore always be analysed processually. It is defined not only by its form, but also by what may arise from it. Morphology is inseparable here from genesis. The closed seed is significant not as a small body, but as the beginning of a cycle. The circle is significant not as a circumference, but as potential wholeness. The nucleus is significant not as a point, but as the beginning of growth. The centre is significant not as a location, but as a source of organisation. A is therefore not a thing, but a state of a process.

The principal morphological meaning of Stage A is that complexity can be folded. This is one of the fundamental principles of the hypothesis. A future branched, multilayered, peripheral and self-similar structure may begin in a compact state. There is nothing mystical about this. Different systems possess mechanisms of compression, storage, concentration, delay, protection and subsequent unfolding. A seed, bud, flower bud, egg, crystallisation nucleus, geological stress and closed composition all demonstrate that complexity does not always begin in an unfolded state.

Stage A therefore possesses a particular aesthetic and philosophical tension. It conceals more than it reveals. It is simple, but not impoverished. It is small, but not insignificant. It is closed, but not dead. It is outwardly motionless, but potentially dynamic. It is precisely this duality that makes the image of the closed seed central to the entire model of the Matrix. It contains the mystery of form, but this mystery must be understood not mystically, but morphogenetically: as latent organisation prior to the moment of manifestation.

Stage A in the A–B–C–D model thus denotes an initial potential wholeness. It is the closed seed, the circular topology of the beginning, a state of maximum concentration of form, latent order and minimal external differentiation. At this stage, the form has not yet unfolded, but it already contains the internal preconditions for its future unfolding. It possesses a boundary, internal potential, latent polarity, the memory of the preceding cycle and a capacity for transition.

The morphogenetic process of the Matrix begins with Stage A. This beginning, however, is neither empty nor final. It contains past and future, protection and possibility, symmetry and latent asymmetry, repose and the threshold of movement. The next stage—B—begins when the closed seed loses its absolute closure, the internal first emerges into the external, and the potential form enters the phase of its first unfolding.

8.2. Stage B: The First Unfolding

Stage B in the A–B–C–D model denotes the moment of the first unfolding. Whereas Stage A was the state of the closed seed, latent order, maximum concentration and minimal external differentiation, Stage B is the first outward emergence of the internal. This is not yet a mature form, a completed structure or the full manifestation of the Matrix. It is, however, already the beginning of morphogenesis in the proper sense: the form ceases to be entirely closed, breaks its initial symmetry, distinguishes a direction and enters the space of development.

The first unfolding should be understood as a transitional state. It lies between latent potential and manifested structure. At Stage A, the form is still gathered within itself; at Stage C, it will begin to grow actively more complex, forming layers, branches, segments and levels; at Stage D, it will reach its maximum manifestation. Stage B is the moment between them: the first breach in the shell, the first shoot, the first bend, the first disturbance of equilibrium, the first line of the future axis and the first manifestation of what was previously concealed within.

In the biological model, Stage B is seen most clearly in the germination of a seed. The seed swells, its coat ceases to be completely closed, the radicle appears, followed by the shoot. Outwardly, this may seem a minor event, but morphogenetically it is of enormous significance. Until this moment, the future form existed as an internal possibility. It now enters the environment for the

first time. The seed no longer merely stores potential; it begins to realise it. The boundary ceases to serve only as protection and becomes a site of transition.

Stage B is therefore the stage at which the initial closure is broken. At Stage A, the shell contained the form. At Stage B, the shell begins to yield to development. This is not necessarily destruction in a crude sense. In normal morphogenesis, the shell does not simply break apart chaotically; it opens a path for an organised emergence. The radicle does not rupture the seed at random, but emerges at a particular point and establishes a direction. A bud does not disintegrate, but opens its petals. A crystal does not explode, but begins to grow from its nucleus. The first unfolding is therefore not chaos, but an organised disruption of closure.

The principal feature of Stage B is the emergence of direction. While the form remains in Stage A, its external organisation may be circular, oval, compact and relatively symmetrical. At Stage B, one direction becomes distinctive. In a seed, this is the direction of root and shoot. In a seedling, it is the vertical direction of movement. In a leaf bud, it is the axis of future unfolding. In a fracture, it is the line of rupture. In a geological fold, it is the direction of deformation. In a cosmic cloud, it may be a region of condensation, expansion or ejection. In a cultural composition, it is the first axis, ray, line or emergence from the centre. Stage B transforms potential space into oriented space.

The emergence of direction means that the original equivalence has been broken. Circular wholeness no longer remains identical in every direction. One section of the boundary becomes more active. An internal polarity becomes visible. A vector begins to organise further development. In this sense, Stage B is the first act of asymmetry. This asymmetry, however, is not a defect. It is a condition for the emergence of form. Without it, the circle-seed would remain a closed potential rather than becoming an unfolded structure.

Stage B may therefore be called the stage of the primary axis. The axis may still be weak, undeveloped and barely indicated. It has not yet generated complex branches, layers or a periphery. Yet it has already changed the entire status of the form. What was closed has become directed. What was internal has begun to emerge. What was potential has become processual. In morphogenesis, this moment is often more important than outward scale: a tiny shoot already contains the principle of the future plant because it establishes the direction of unfolding.

Stage B is also associated with the concept of a threshold. The transition from A to B occurs when the previous state can no longer be maintained in its former form. A seed encounters the conditions required for germination. A bud reaches the maturity required for opening. Internal pressure exceeds the resistance of the shell. Geological stress reaches a level at which a fracture or fold appears. Instability increases within a gas cloud. In a cultural form, a closed sign begins to unfold into a composition or interpretation. Stage B always begins with the crossing of a threshold.

The threshold character of Stage B is important because it distinguishes development from random change. Not every instance of damage to a shell is morphogenesis. A seed may be destroyed and die. A stone may split at random without generating a stable structure. A symbol may be distorted without acquiring a new meaning. At Stage B, the disruption of closure must be incorporated into a process of further organisation. The first unfolding must open a path towards Stage C rather than merely destroy Stage A. B is therefore not just any rupture, but a productive outward emergence of the internal.

In biology, the productivity of Stage B is expressed by the way in which the first shoot establishes the future organisation. The root begins its relationship with the soil, while the shoot moves towards the light. A vertical polarity emerges: downwards and upwards, concealed and exposed, nourishment and growth, earth and air. This polarity will subsequently become the basis of further development—the stem, leaves, branching and flowering. What appears at Stage B as a simple line will later become the axis of the entire organism. The first line is therefore decisive for the destiny of the form.

In the leaf-like model, Stage B corresponds to the moment when the folded form begins to unfold. A young leaf emerges from the bud; its folds begin to separate, the central vein becomes visible, the surface has not yet opened fully, and the edge has not yet attained its final form. This is a state of particular importance: the leaf is no longer closed, but has not yet become a mature plane. The process of transition itself is visible within it. Stage B displays form in motion, as its concealed structure only begins to become manifest.

The flower bud also provides a powerful image of Stage B. Before opening, it belongs to Stage A as a closed potential structure. At the beginning of flowering, it passes into B. The petals begin to separate, the centre may remain partly concealed, and the external form has already lost its former closure, although its full radiality is not yet manifested. This intermediate state possesses a distinctive morphological expressiveness: it displays not the result, but the beginning of manifestation. The flower is not yet fully open, but its latent order has already become visible.

In geology, Stage B may be manifested as the first fracture, the first fault, the beginning of a fold, an incipient channel or the first exposure of a layer at the surface. Until this moment, the structure may have remained concealed within a massif, a field of stress, at depth or in a potential zone. At Stage B, it acquires a visible line for the first time. A fracture reveals the direction of stress. An incipient channel reveals the direction of drainage. A fold reveals the beginning of deformation within the strata. An exposure reveals the internal structure of the rock. In each case, the Earth's internal state becomes external morphology for the first time.

A fracture is particularly instructive for understanding Stage B. It is a line through which latent stress becomes visible. Before the fracture appears, the rock may seem intact. Afterwards, a boundary, an edge, a direction and the possibility of branching emerge within it. The fracture does not yet constitute a complex network, but it may become its beginning. It therefore corresponds to Stage B as the first act of unfolding a latent structure. It disrupts integrity while simultaneously creating a new morphological possibility.

In a river system, Stage B may be associated with the emergence of the first stable direction of drainage. Prior to this, the surface may contain gradients, depressions and latent possibilities for a future network. When a flow begins to establish a channel, however, the line of the future organisation appears. This is not yet a branched river system, but the beginning of distribution. The flow selects a path, deepens it and reinforces the distinction between the channel and the surrounding surface. In this way, the latent structure of the relief passes into a visible hydrological form.

In cosmic material, Stage B requires particularly cautious description. Biological germination cannot be transferred literally to the cosmos. It is nevertheless possible to speak of the first manifestation of instability, concentration, ejection, expansion, rotation or shell formation. A gas cloud may begin to condense. A region of matter may acquire a centre of activity. A stellar wind or explosive event may form an initial shell. Rotation may begin to organise a disc. In all such cases, an internal or distributed dynamic becomes morphologically expressed for the first time.

Cosmic Stage B demonstrates that the first unfolding need not be an emergence from a shell; it may also be the manifestation of structure within a field of matter. Where previously there was relative inhomogeneity or cloudiness, a direction, boundary, front, centre, arc, ejection or the beginning of a spiral appears. This is not yet a completed nebula or galactic structure, but the beginning of morphological organisation. It is particularly important here to remember that the issue is not resemblance to a plant, but a structural transition from potential concentration to manifested dynamics.

In cultural systems, Stage B may be expressed as the first unfolding of a sign. A point becomes a line. A circle acquires an axis. A centre begins to emit rays. A closed composition opens through ornament. A scroll is unrolled. A book is opened. A sacred centre acquires a direction towards the periphery. In architecture, Stage B may be associated with the emergence of an entrance axis, portal, passage, corridor, vertical, or staircase. A cultural form begins to unfold its latent meaning in space or representation.

Like cultural Stage A, however, cultural Stage B has a hermeneutic status. It does not demonstrate physical morphogenesis, but displays the symbolic logic of unfolding. In culture, human beings repeatedly reproduce the transition from closed to open: they open a door, unroll a scroll, cross a threshold, look from centre to periphery, and read a sign as the unfolding of meaning. These forms are important to the Matrix as cultural analogues of the morphogenetic process, but they must be analysed with due regard for their historical context.

Stage B is also a stage of vulnerability. At Stage A, the closed seed is protected. As soon as germination begins, however, the form becomes more exposed to environmental influences. The seedling is fragile. An opening bud is sensitive. An incipient fracture may propagate or stop. An initial channel may be destroyed or reinforced. The primary structure has not yet stabilised. Stage B is therefore not only a beginning, but also a risk. The form has emerged from protection but has not yet achieved stability.

This vulnerability has an important philosophical meaning. Development always requires the risk of disclosure. While a form remains closed, it preserves its potential but does not realise it. To become itself, it must emerge, and in doing so expose itself to external influences. Stage B is the first moment of this risk. It demonstrates that morphogenesis is impossible without the loss of former protection. The closed seed must cease to be merely closed if it is to become a plant.

Within the Matrix model, the transition A → B is therefore a movement from preservation to realisation. At Stage A, potential is preserved. At Stage B, it begins to be realised. Realisation, however, is always partial and uncertain. The future form is not yet guaranteed in every detail. Much depends upon the environment, conditions, random influences, internal resources and subsequent dynamics. Stage B is therefore the beginning of a path, not its completed result.

Stage B is also associated with the first division between internal and external. At Stage A, the internal is concealed behind a shell. At Stage B, part of the internal becomes external. A shoot emerges. A petal begins to open. A layer is exposed. A fracture brings internal stress to the surface. A symbol begins to disclose its meaning. The internal does not, however, become completely external. Full unfolding will occur only at Stage D. B is therefore a state of partial manifestation. It marks the beginning of the process by which latent order is externalised.

This partial character makes Stage B particularly important for analysis. It reveals how a form selects its trajectory. In a mature form, many elements have already stabilised, and the initial dynamic may be concealed. At Stage B, it is still possible to see where the unfolding began, where

the point of emergence lay, which axis formed first, and how the shell began to become an edge. Stage B is therefore morphologically informative: it displays not only structure, but the direction of becoming.

In a biological seedling, one can see how the plant orients itself within its environment. In an opening leaf, one can see how a fold becomes a surface. At the beginning of a fracture, one can see how stress selects a line. In a young channel, one can see how a flow begins to organise the relief. In an incipient composition, one can see how a centre acquires an axis. Stage B thus makes it possible to reconstruct the logic of the future form. It reveals the Matrix's first selection.

The word 'selection' should not be understood subjectively here, but structurally. The form does not choose consciously. Direction arises through the interaction of internal conditions and the external environment. A shoot is oriented through biological mechanisms. A fracture propagates along a line of stress and weakness. A flow follows a gradient. A gas cloud is organised by physical forces. A cultural composition is constructed by a human being according to semantic and artistic principles. In every case, however, structural selectivity arises: of many possible directions, one or several become actual.

Stage B is also the stage of primary differentiation. While the form was closed, differences remained latent. They now begin to become manifest. In the seed, the distinction between root and shoot appears. In the bud, the distinction between the internal centre and the opening petals emerges. In the leaf, the distinction between the central vein and the future surface becomes evident. In the fracture, two edges appear. In the channel, the flow becomes distinct from the surrounding surface. In the symbol, the centre becomes distinct from the direction. These initial differences form the basis of subsequent complexity.

Stage B is not yet, however, a multilayered structure. It only opens up the possibility of Stage C. It must therefore not be overloaded with features of completion. A layer may be indicated at Stage B, but is not yet developed. Branching may be potential, but not yet formed. An edge may appear, but has not yet become complex. Facets may only begin to emerge. What matters in Stage B is the beginning of outward emergence, direction and primary asymmetry. Everything else will unfold later.

In this sense, Stage B is a phase in which the axis originates. This axis may be not only geometrical, but also processual. It is the line of future growth, unfolding, rupture, movement or interpretation. In a plant, the axis is associated with verticality and the stem. In a leaf, it is associated with the central vein. In geology, it is associated with a fault, fold or channel. In the cosmos, it may be the direction of ejection, rotation or condensation. In culture, it may be a vertical, horizontal or diagonal line, a ray, road or portal. The axis establishes the order of the future space.

The appearance of an axis changes the status of the centre. At Stage A, the centre may have been concealed or uniformly related to the boundary. At Stage B, the centre begins to act. It is no longer merely a point of concentration, but a source of direction. The centre emerges from itself through the axis, as it were. In a seed, the internal embryo emerges as a shoot. In a circular composition, the centre sends out a ray or line. Within geological stress, a point of weakness becomes the origin of a fracture. In a cosmic concentration, a centre of activity begins to form a shell or ejection. The centre becomes a process.

Stage B also changes the status of the boundary. At Stage A, the boundary was the shell, protection and limit of the closed form. At Stage B, it becomes the site of unfolding. It is disrupted, opened, bent, parted or fractured; it becomes a threshold. This transformation of the shell into a

threshold is one of the principal features of Stage B. The form does not yet possess a fully developed active edge, but it ceases to be completely closed. The boundary begins to function as a site of transition.

The threshold boundary is especially important in cultural forms. A door, portal, arch, gate, unrolled scroll, open book, unfolded mandala or line emerging from a centre are all cultural images of Stage B. They display the moment at which an internal space becomes accessible. In architecture, a threshold literally transfers a person from outside to inside, or from one level to another. In symbolism, the threshold mediates the transition from sign to meaning. Cultural analysis of Stage B may therefore be associated with the theme of transition.

In natural forms, the threshold also has a material expression. The seed coat opens to admit the shoot. The surface of the rock is ruptured by a fracture. A layer emerges at an exposure. A gaseous shell expands. Tissue bends. In every case, the threshold signifies that the previous boundary has changed its function. It no longer merely contains; it admits, releases, opens and directs. This change in the function of the boundary is one of the principal mechanisms of morphogenesis.

Stage B is also associated with the emergence of the first periphery. At Stage A, the periphery was the outer shell. At Stage B, a new periphery develops around the emerging structure. A seedling has its own edge and apex. A fracture has two edges. The edge of an opening petal begins to separate from the bud. An incipient channel has banks. The primary shell of a nebula has a front. These edges are not yet fully developed, but they already demonstrate that the form has begun to create new boundaries.

Stage B thus not only disrupts an old boundary, but also creates new ones. This is important. Morphogenesis does not eliminate boundaries altogether; it transfers them to a new level. The seed coat opens, but the boundary of the seedling emerges. A bud opens, but the edges of the petals appear. Rock fractures, but the edges of the fracture emerge. A circle acquires an axis, but new regions of the composition are formed. The development of form is not the disappearance of determinacy, but the redistribution of boundaries.

Stage B is also the moment at which internal order first becomes externally verifiable. While the form remained closed, its structure could be inferred only indirectly. The first unfolding reveals whether it genuinely possessed potential. A seed that has produced a shoot demonstrates its viability. A bud that has begun to open reveals the concealed structure of its petals. A fracture reveals the presence of stress. The initial axis of a composition reveals the presence of an organising centre. In this sense, B is the first empirical manifestation of Stage A.

This proposition is important to the methodology of the hypothesis. Stage A may be inferred, but Stage B often supplies the first visible material for analysis. If nothing emerges from a closed form, its morphogenetic status remains uncertain. If a shoot, axis, fracture, ray, line, fold or front appears, however, a transition may be identified. Stage B is therefore the moment at which the hypothesis begins to work with visible features.

Stage B also shows that the development of form begins with something small. The first shoot is small in comparison with the future plant. The first fracture is small in comparison with a network of faults. The first channel is small in comparison with a river system. The first ray of a composition is small in comparison with an ornament. Yet it is precisely this small event that establishes the subsequent structure. In morphogenesis, the small may have systemic significance. Stage B is therefore the stage of the morphological germ already present within unfolding.

In this sense, B may be called the ‘seed of the axis’. If A was the seed of the entire form, B is the seed of direction. It does not yet contain full branching, but it establishes the path. Secondary directions may arise from the first direction; a network may arise from the first line; a surface from the first emergence; a fault system from the first fracture; and a radial composition from the first ray. Stage B is thus the small beginning of major differentiation.

Non-linearity is especially important at Stage B. A small deviation may be amplified. A slight asymmetry may become the principal axis. A local difference in growth may determine the shape of a leaf. A minor stress may direct a fracture. A slight gradient may determine future drainage. A small inhomogeneity of density may become a centre of concentration. Stage B therefore demonstrates how a small difference becomes a structural factor. This connects it with theories of self-organisation and non-linear development.

Not every small difference is amplified, however. Some seedlings die. Some fractures cease to propagate. Some channels disappear. Some compositional lines do not become dominant. Stage B is therefore also a stage in the selection of directions. The environment, material, internal resources and feedback determine whether the first unfolding will continue. Morphogenesis is not automatically guaranteed. It requires stable continuation. This is another reason why B is a risky and transitional stage.

In the Matrix model, Stage B must be described as the beginning of manifestation rather than its completion. It must not be idealised. It may be weak, incomplete, unstable, reversible and dependent upon conditions. A seed may begin to germinate and die. A bud may fail to open. A fracture may cease to propagate. A flow may change direction. A cosmic inhomogeneity may disperse. A symbol may receive no further interpretation. B is therefore a possibility of development that has entered into action, but has not yet become a stable system.

In some systems, Stage B may be reversible or partly reversible. A leaf may remain folded under unfavourable conditions; a flower may close and reopen; a fracture may be arrested; cultural disclosure may be interrupted. In other systems, the transition is irreversible: a germinated seed does not return to its previous state, and fractured rock has already changed. This difference demonstrates that the A–B–C–D model must take the type of system into account. The general schema does not negate specific dynamics.

The first unfolding is also associated with a change in the energetic state of the form. The closed structure contained potential. In B, this potential begins to be expended and transformed into movement, growth, deformation, expansion or semantic unfolding. In biology, this is associated with metabolic activity, growth, cell division and changes within tissues. In geology, it is associated with the release of stress or the direction of a flow. In the cosmos, it is associated with the dynamics of matter and energy. In culture, it is associated with an act of creation or interpretation. In every case, B converts latent possibility into an active process.

This conversion requires energy or action. A form does not unfold without cause. A seed germinates through biological and environmental conditions. A fracture arises from stress. A river is formed by the movement of water. A cosmic structure arises through physical processes. A symbol unfolds through consciousness and cultural practice. Stage B is therefore energetically significant: it shows that the form has begun to operate.

In philosophical terms, Stage B expresses the transition from possibility to actuality. At Stage A, the form was possible. At Stage B, it has become active, but is not yet complete. This intermediate state may be termed initial actualisation. Possibility is no longer merely preserved; it begins to be

realised. Yet its realisation remains open. The future of the form is not yet fully determined. B therefore combines determinacy and indeterminacy: a direction has appeared, but the result still lies ahead.

This status makes Stage B especially important to an understanding of the freedom of variation within the Matrix. At Stage A, the type of possibility is already constrained. At Stage D, the result is relatively stable. At Stage B, however, the trajectory may still change. The environment may reinforce one direction and weaken another. Growth may proceed more quickly or more slowly. A fracture may branch or stop. A leaf may unfold symmetrically or become deformed. Stage B is therefore a region of high sensitivity. Small differences in conditions may influence the subsequent form.

In this respect, Stage B is close to the concept of bifurcation. A system leaves its previous equilibrium and may enter different trajectories. Not every first unfolding is, of course, a bifurcation in the strict mathematical sense. Morphologically, however, B often denotes the moment at which the original wholeness ceases to be the only possible state and subsequent development acquires direction. The form enters a region in which a trajectory is selected under the influence of internal and external factors.

Stage B is also important for understanding future multilayeredness. The first unfolding frequently creates the basis for layers and branches. A shoot creates an axis along which leaves, nodes and lateral shoots will subsequently appear. An opening bud reveals layers of petals. A fracture may become the beginning of a branched network. An incipient channel may gather tributaries. A cosmic front may become a shell with internal and external zones. A cultural axis may organise tiers and segments within a composition. B therefore prepares Stage C.

Stage B possesses its own features, which may be used in analysis. The first is the disruption of the previous shell or boundary. The second is the appearance of a direction or axis. The third is the partial outward emergence of the internal. The fourth is primary asymmetry. The fifth is threshold dependence and sensitivity to conditions. The sixth is instability and incompleteness. The seventh is the possibility of further differentiation. If these features are present, an object or process may be assigned to Stage B.

A germinating seed, for example, possesses all these features. So does an opening bud. An incipient fracture exhibits a disruption of integrity, direction, edges and the possibility of branching. A primary channel possesses direction and the future potential of a network. A compositional centre with its first axis exhibits the initial unfolding of meaning. A cosmic ejection or front possesses direction and marks the beginning of structuring. In every case, however, the specific nature of the object must be taken into account, and a biological mechanism must not be transferred to other systems.

Stage B also helps distinguish unfolding from destruction. Outwardly, they may resemble one another: a shell is disrupted, a surface fractures, a boundary is ruptured. Morphogenetically, however, they are different processes. Unfolding leads to a new organisation. Destruction may lead to disintegration without a new structure. Destruction may sometimes itself become the beginning of new morphogenesis, as in geology, where disintegrated rock may become the material of new strata. What matters for Stage B, however, is that the disruption should be associated with further form generation. Analysis must therefore ask: what arises after the rupture?

In biology, the answer is generally clear: a plant arises from germination, and a flower from the opening of a bud. In geology, the answer may be more complex: a fracture may become a fault, channel, failure surface, conduit for water or the beginning of a new structure. In culture, the unfolding of a sign may generate a composition or system of meaning. In the cosmos, a primary front may become part of a shell or a region of structuring. If further organisation can be traced, Stage B has morphogenetic status.

An important aspect of Stage B is the partial loss of the original form. In germinating, a seed ceases to be the seed it was. In opening, a bud ceases to be a closed bud. In fracturing, rock ceases to be intact in its former sense. In acquiring an axis, a circle ceases to be a purely uniform circumference. Development requires the loss of a former wholeness. Yet this loss is the condition of a new wholeness. Stage B demonstrates that morphogenesis always includes a moment of relinquishing the original form.

This proposition has philosophical significance. A form cannot become unfolded while retaining absolute closure. Complexity cannot arise without difference. An axis cannot be created without breaking the equivalence of directions. A transition to a new cycle cannot occur without transforming the previous one. Stage B therefore expresses the principle that development begins with a productive loss. The form loses its previous protection and symmetry in order to acquire direction and the possibility of future complexity.

Stage B is also the moment at which the first edge of a new type appears. The seedling develops a growing tip. A fracture develops edges of rupture. An opening petal acquires a free edge. An incipient channel develops banks. A compositional ray creates a direction that separates regions. This new edge is not yet mature, fully undulating or serrated, but it already exists as an active boundary. B is therefore the beginning of the periphery.

At Stage C, this edge will become more complex. It may become serrated, undulating, branching, layered, scalloped or fragmented. Its origin, however, lies in B. The first unfolding creates the first edge, and subsequent development makes it complex. The A–B–C–D model therefore displays the sequence: shell—threshold—edge—complex periphery. This is an important transition for the hypothesis as a whole.

Stage B also makes it possible to understand the role of the environment. At Stage A, the environment was a condition of preservation or waiting. At Stage B, it becomes a direct participant in unfolding. A shoot enters the soil and air. A leaf emerges into the light. A fracture interacts with pressure and external influences. A channel is formed by water and relief. A cosmic structure interacts with surrounding matter. A symbol unfolds in perception. Without an environment, the first unfolding acquires neither direction nor continuation. B is therefore the form's first open encounter with the world.

This encounter may be favourable or unfavourable. The environment may support growth or arrest it. It may reinforce a fracture or stabilise the material. It may direct a flow or destroy the channel. It may give meaning to a symbol or leave it incomprehensible. Stage B is therefore a stage at which potential is tested. At Stage A, the form could preserve a possibility. At Stage B, it becomes clear whether this possibility can begin actual development.

Stage B may be called the first trial of the Matrix. Internal order must emerge from concealment and enter into interaction. If it can organise this interaction, the process will continue. If it cannot, the form may stop, disintegrate or follow a different path. B therefore has a dramatic character: it

is the beginning of manifestation, but not yet a guarantee of success. In this sense, it is the most fragile stage of the model.

Methodologically, Stage B requires attentive description of transitions. It is necessary to record not only the fact of unfolding, but also its character. Where precisely is the boundary disrupted? Which direction appears first? Is the unfolding axial, radial, fracture-like, folded, wave-like, ray-like or frontal? How is the first line connected with the internal structure of Stage A? Which environmental conditions are involved? Do new edges emerge? Are there signs of further differentiation? These questions make it possible to analyse B rigorously rather than impressionistically.

In biological material, such questions may be applied to germination, buds, young leaves, flower buds and embryonic forms. In geology, they may be applied to fractures, folds, channels, exposures and initial deformations. In the cosmos, they may be applied to fronts, ejections, shells, centres of activity and condensation structures. In culture, they may be applied to compositional axes, initial lines extending from a centre, unfolding symbols, portals, scrolls and primary ornamental motifs. In each case, B must be associated with a process rather than merely with an outward resemblance.

Stage B is also important for future illustrative comparisons. Suitable images include seedlings, opening leaf buds, partially opened flower buds, young leaves, incipient fractures, initial faults, exposed layers, nebular fronts and radial or axial symbolic compositions. Such images must be selected not for their beauty, but for their ability to demonstrate a transition: the closed state has already been disrupted, but the full form has not yet been attained. An illustration of Stage B must convey processuality.

Philosophically, Stage B may be called the moment at which form is born. This birth, however, must not be understood as emergence from nothing. It is a birth from latency. It occurs when the internal organisation finds an outlet into the external. B therefore unites birth and unfolding, beginning and risk, axis and asymmetry, threshold and future. In it, the Matrix first becomes visible as a process.

Stage B also demonstrates that every form has an event of beginning. Even when this event is extended over time, it involves a transition: what was closed begins to open; what was concealed begins to appear; what was in equilibrium becomes directed; what was potential becomes active. This transition may be slow or rapid, gentle or abrupt, biological or geological, physical or symbolic. Without it, however, no morphogenetic history arises.

Stage B in the A–B–C–D model thus denotes the first unfolding of form. It is the moment at which the closed seed ceases merely to be closed, the shell becomes a threshold, the internal structure emerges outward for the first time, a direction arises, primary asymmetry appears and interaction with the environment begins. The form is not yet complete, but it has entered into development. It remains fragile and unstable, yet it already carries the trajectory of its future multilayered structure.

The first unfolding is therefore the decisive transition between potential and form. Stage A preserved latent order; Stage B begins to manifest it. It is here that the Matrix first becomes visible—in the shoot, fracture, axis, opening petal, incipient channel, cosmic front or compositional line. The next stage—C—will show how this first emergence grows more complex, forming a multilayered structure, segments, branches and internal and external levels.

8.3. Stage C: The Multilayered Structure

Stage C in the A–B–C–D model denotes the phase in which form actively increases in complexity. Whereas Stage A was the closed seed and Stage B the first unfolding, Stage C represents the process of differentiation through which form produces layers, segments, branches, facets and internal and external levels. At this stage, the form is no longer a latent potentiality, but has not yet reached complete unfolding. It is in a state of unfolding in which the primary axis, fracture, shoot, ray, fold or front begins to generate a complex structure.

Stage C is the most saturated and dynamic part of the morphogenetic process. It is here that what was prepared at Stage A and initiated at Stage B becomes manifest. Potential ceases to be unitary and closed; the first direction ceases to be solitary; internal organisation begins to emerge not as a single line, but as a system of relations. Lateral directions, levels, boundaries, intermediate zones, repeating elements, local centres and active edges arise. The form ceases to be simple and becomes multilayered.

The principal meaning of Stage C lies in the transition from a primary axis to organised multiplicity. At Stage B, the form acquired direction. At Stage C, this direction begins to differentiate. A shoot produces leaves and future branches. The central vein of a leaf generates lateral veins and a network. An opening flower bud reveals layers of petals. A fracture begins to branch. A channel forms a system of tributaries. A gaseous shell acquires filaments, arcs, fronts and regions of differing density. A symbolic centre unfolds into a complex composition. In each case, the primary emergence becomes a structure.

Stage C may therefore be called the stage of organised diversity. Here diversity is not chaos. It remains connected with the original centre, axis, line or direction. Differences arise within the whole and retain their relationship to it. A layer is connected with the preceding and succeeding layers. A branch is connected with the axis. A facet is connected with the surface. An edge is connected with the internal structure. A segment is connected with the composition. It is this connectedness that distinguishes morphogenetic complexity from disintegration.

Stage C is particularly clear in biological development. Once a seed has germinated, the plant begins to differentiate actively. A root system, stem, leaves, nodes, lateral shoots and buds appear, followed by the flower bud and flower. Each new element is not simply added mechanically, but incorporated into the organism’s overall structure. The root connects the plant with the soil, the stem establishes the vertical axis, the leaves unfold the surface of exchange, the veins distribute substances, and the leaf edges interact with the environment. Form becomes a system of interconnected parts.

The leaf is one of the clearest images of Stage C. At Stage B, only the beginning of unfolding could be seen: the central vein, emergence from the bud and the opening of the surface. At Stage C, the leaf acquires a complex internal organisation. The principal axis generates lateral veins; the lateral veins generate a finer network; the surface is divided into regions; and the edge becomes serrated, undulating, lobed or otherwise articulated. The leaf is no longer simply opening; it is constructing a multilayered, multilevel system.

Of particular importance within this structure is the relationship between the principal axis and the network. If only the axis existed, the form would remain linear. If only the network existed without an axis, the form might lose its directionality. Stage C combines these two principles. The axis maintains order, while the network distributes it through space. Leaf structure thus becomes

a model of how the Matrix converts a single direction into a branched, functional and self-similar organisation.

At Stage C, the layer acquires a distinctive role. The form begins to develop not only in length or breadth, but also in depth. In biology, this may involve tissue layers, shells, rows of petals, levels of growth, and internal and external surfaces. In geology, it may involve strata, mineralogical zones, folded structures, sedimentary layers, lava flows, and lines of pressure and deformation. In the cosmos, it may involve shells, expansion fronts, zones of differing density, levels of luminosity, and regions of gas and dust. In culture, it may involve tiers, levels of meaning, nested circles, ornamental rows, architectural storeys and compositional planes.

A layer demonstrates that a form possesses a history. It records a sequence of states, accumulations, unfoldings or influences. At Stage C, this history becomes visible. Whereas Stage A preserved the past as folded potential and Stage B manifested it for the first time, Stage C begins to inscribe the process into the very structure of the form. Each layer becomes the trace of a stage. The form does not merely develop; it begins to preserve the history of its own development.

At Stage C, the facet represents the articulation of the surface. An unfolding form does not remain smooth and homogeneous. It is divided into regions, faces, segments, fields, lobes, cells and planes. In a leaf, the regions between the veins are facet-like. In a crystal, they are actual faces. In mountainous terrain, they take the form of slopes, scarps and terraces. In stone, they appear as mineralogical fields and fracture surfaces. In architecture, they may be façades, portals, windows, niches and tiers. In a symbolic composition, they may be sectors, rays, triangles, petals or ornamental fields. The facet makes the whole visible as a combination of distinguishable parts.

Branching is one of the most important processes at Stage C. The primary axis begins to generate secondary directions. These may in turn generate tertiary directions, producing a hierarchy. In biology, examples include the branches of a tree, leaf veins, roots, vascular networks, bronchial structures and neural ramifications. In geology, they include river systems, fractures, faults, ravines, lava flows and submarine canyons. In the cosmos, they may include filamentary structures in the distribution of matter, although caution is required here and biological branching must not be transferred literally. In culture, examples include tree-like diagrams, ornaments, genealogies, World Trees and compositional ramifications.

Branching demonstrates that a form is capable of distributing a process. One direction becomes many directions. Yet this multiplicity does not lose its connection with the original structure. Each branch retains a relationship to the trunk or axis. Each tributary is connected to a channel. Each vein belongs to the overall network of the leaf. Each ornamental element relates to the centre or rhythm of the composition. Branching is therefore not disintegration, but a means of preserving unity through multiplicity.

Fractality becomes especially prominent at Stage C. Self-similarity arises not in the closed seed or first shoot, but in the process of repeated differentiation. A branch repeats the principle of the tree; a vein repeats the principle of the principal vein; a small fracture repeats the character of a larger fracture; a small tributary repeats the principle of the channel; and an ornamental element repeats the motif of the whole. This repetition is not exact, but variable. Stage C is therefore the stage of the fractal unfolding of the Matrix.

Here fractality should be understood as the recurrence of a principle of organisation at different levels. Stage C does not mechanically produce identical copies. It produces nested, hierarchical and self-similar structures. This distinguishes it from a mere increase in size. The form does not

simply grow larger. It begins to contain levels at which a part reproduces the structural logic of the whole. This makes Stage C central to an understanding of the universality of the Matrix.

The active edge also appears at Stage C. At Stage B, the first edge of a new type emerged: the edge of the shoot, fracture, petal, channel, front or line. At Stage C, this edge begins to grow more complex. It becomes serrated, undulating, layered, broken, scalloped, lobed, branching or rhythmically organised. The edge demonstrates that the form has entered into sustained interaction with its environment. It has not only emerged; it has begun to respond to external conditions.

The edge is especially important at Stage C because it records the individuality of the form. Its general type may be established by the centre, axis and internal structure, but the concrete history of a form is often most clearly visible at its edge. A leaf edge records the rhythm of growth and the conditions of development. A coastline records the interaction of land and water. The edge of a fracture records the resistance of the material. The edge of a nebula records the interaction of gas, radiation and the surrounding environment. A frame or ornamental border records a cultural method of completing a composition. Stage C is therefore the stage at which form begins to acquire its individual biography.

The fold also becomes highly significant at Stage C. Whereas at Stage A the form was folded as potential and at Stage B began to unfold, at Stage C the fold may operate in two ways. On the one hand, it may flatten out, as in an unfolding leaf or opening petal. On the other, it may arise through growth, pressure, compression, deformation or increasing surface complexity. The fold is therefore not only a trace of the closed state, but an active mechanism through which form becomes more complex.

In biology, folds create new surfaces, cavities, shells, organs and functional zones. In geology, folds reveal the deformation of strata and stresses within the Earth's crust. In culture, a fold may be physical, architectural, compositional or semantic. In the cosmos, it is permissible to speak only of fold-like arcs, waves and shells as morphological analogues of curvature or a front. In every case, the fold indicates that form develops not uniformly or in a single plane, but through bending, superposition and internal differentiation.

Stage C is also the stage at which internal and external levels emerge. At Stage A, the internal was concealed. At Stage B, it emerged for the first time. At Stage C, the internal and external begin to form a system. A leaf possesses an internal network and an external edge. A flower possesses a centre, layers of petals and a periphery. A geological structure possesses internal strata and an external exposure. A nebula possesses internal zones, shells and peripheral fronts. Architecture possesses internal space, façade, portal and boundary. A symbol possesses internal meaning and an external composition.

This organisation of internal and external levels is particularly important to the mature form. Form cannot consist only of an outer shell, for it would then be superficial. Yet it cannot remain only an internal potential, for it would then remain concealed. Stage C connects the internal and external through a system of transitions. A layer brings internal history to the surface. A facet articulates the surface. The edge connects the form with its environment. Branching distributes internal order. The fold turns the internal into the external and the external into the internal.

In this sense, Stage C is a phase of structural translation. Internal order is translated into visible morphology. What at Stage A was latent polarity becomes, at Stage C, an axis, vein, fold, layer,

branch or edge. What at Stage B was the first emergence becomes, at Stage C, a system. C is therefore the stage at which the Matrix begins to speak its full morphological language.

Stage C is not yet complete unfolding, however. This must be emphasised. The form is already complex, but continues to develop. Layers may continue to form. Branching may intensify. The edge may grow more complex. Folds may flatten out or arise anew. The periphery has not yet attained its final configuration. Stage C is therefore a stage in the growth of structure rather than its completion. It is dynamic, open and sensitive to conditions.

In biological development, Stage C may correspond to the active growth of a leaf, the formation of a crown, the development of a flower bud and the formation of complex tissues and organs. The form is already recognisable, but not yet mature. In geology, C may correspond to folding, the branching of fractures, the formation of a river network, the accumulation of strata and the development of relief. In the cosmos, it may correspond to the formation of shells, filaments, fronts, regions of differing density, and complex structures of gas and dust. In culture, it may correspond to the unfolding of a composition, increasing complexity of ornament, the construction of an architectural system or the elaboration of a symbolic field. In every case, C denotes the active becoming of a complex form.

Stage C may be described as a space of multiple feedback loops. At Stage B, a direction had only just appeared. At Stage C, different parts of the form begin to influence one another. Growth in one region affects another. The edge responds to the environment and alters subsequent development. Branching redistributes flows. One layer affects the next. A fracture changes the stresses within a material. A channel alters the relief and is itself altered by the flow. An ornamental element establishes a rhythm for those that follow. The form becomes a system of interdependencies.

It is feedback that makes Stage C non-linear. A small change in one region may alter the subsequent configuration. Local growth of an edge may produce a wave or serration. A small fracture may induce branching. A minor gradient may reinforce a channel. A local density inhomogeneity may alter the front of a cloud. A small ornamental element may establish the rhythm of an entire composition. Stage C is therefore especially sensitive to conditions and variations. It creates the individuality of the form.

Stage C also demonstrates that form does not develop as the simple execution of a predetermined plan. Internal potential is important, but it continuously interacts with the environment. A leaf grows under particular conditions of light, moisture, wind and damage. A river system develops within a particular relief and climate. A fracture propagates through a particular material. A nebula forms within a particular interstellar environment. A symbolic composition develops within a particular cultural tradition. The multilayered structure is therefore the result of both internal order and external conditions.

In this respect, Stage C shows particularly clearly how the Matrix differs from a rigid schema. If the Matrix were a simple blueprint, Stage C would produce identical forms. Actual development, however, produces variability. Layers may differ in thickness, branches in length, edges in complexity, facets in orientation and folds in depth. The Matrix is manifested not in uniformity, but in a recurring logic that organises differences. Stage C is the clearest demonstration of this logic.

Multilayeredness at Stage C may be both material and structural. Material multilayeredness is expressed through physical layers: tissues, strata, shells, tiers and rings. Structural

multilayeredness is expressed through levels of organisation: a principal axis, secondary axes, network, edge, modules and local centres. Symbolic multilayeredness is expressed through levels of meaning. These types should not be conflated, but they may be compared as different forms of organisation by levels. It is here that the Matrix functions as a meta-theoretical language.

Stage C also introduces the problem of scale. At this stage, a form may be read at several levels simultaneously. A tree possesses a trunk, branches, twigs, leaves and leaf veins. A river system possesses a main river, tributaries, small streams and microrelief. A stone possesses a large-scale texture, fine veins and microfractures. A nebula possesses a large shell, filaments, local condensations and luminous boundaries. An ornament possesses an overall plan, repeating motifs and fine elements. Stage C makes form multiscalar.

Multiscalarity is one of the most important features of the Matrix. It shows that a structure is not exhausted by a single level. A form may be whole at a large scale and simultaneously complex at a smaller one. Moreover, smaller levels may repeat the principles of larger ones. This is the fractal logic of Stage C. If Stage A concentrates the whole and Stage B establishes direction, Stage C distributes the whole across levels.

In biology, this multiscalarity is connected with function. The branching of vessels, veins, roots and bronchi enables the distribution of substances, air, water and signals. Increasing surface area through layers and folds facilitates exchange. Segmentation permits the specialisation of parts. The edge enables contact with the environment. A multilayered structure is therefore not superfluous complexity. It is functional. Form becomes complex because it performs complex tasks.

Function has a different meaning in geology. A geological form has no biological purpose, but its structure expresses the distribution of forces, matter and time. Layers record accumulation. Folds record pressure. Faults record stress. River networks record drainage. Coastlines record the interaction of land and water. A multilayered geological structure is not an organism's function, but a record of processes. At the morphological level, however, it likewise displays organised complexity.

In the cosmos, multilayeredness is not functional in the biological sense either. It expresses the distribution of matter, energy, density, radiation, gravity, magnetic fields, shock waves and turbulence. Shells, filaments, fronts and regions of brightness are traces of dynamics. Cosmic Stage C is therefore a stage of manifested structural inhomogeneity. It demonstrates that a cosmic form is not a homogeneous cloud, but may possess a complex hierarchy of levels.

In culture, Stage C is a phase of unfolded meaning. An originating sign or centre begins to generate compositional levels. Tiers, ornament, figures, axes, frames, repeating motifs and symbolic zones appear. Architectural form acquires façades, internal spaces, transitions, columns, domes, portals and staircases. A text acquires chapters, sections, arguments and levels of meaning. Here multilayeredness is not a natural process, but a cultural organisation. Its morphological logic may nevertheless be described through the Matrix.

Stage C is also the stage at which the risk of excessive analogy is greatest. Because complex forms from different domains may indeed resemble one another visually, there is a temptation to declare them direct manifestations of a single mechanism. This must not be done. A leaf network, river network, fracture network, neural network, cosmic filamentary structure and ornamental network have different causes. They may, however, be compared as different forms of

distributed, hierarchical or branching organisation. The resemblance is morphological rather than one of causal identity.

Stage C therefore requires a rigorous distinction between levels. At the natural-scientific level, the specific mechanisms must be taken into account: tissue growth, pressure in rocks, hydrological drainage, gas dynamics and gravity. At the comparative-morphological level, layers, branches, edges, networks, facets and folds may be described. At the philosophical and hermeneutic level, symbolic and cultural forms may be analysed. If these levels are conflated, the hypothesis loses precision. If they are distinguished, Stage C becomes a powerful analytical instrument.

The internal logic of Stage C may be represented as a transition from the one to the many through connection. Stage A was a single latent potential. Stage B generated the first direction. Stage C creates many elements, but this multiplicity remains connected. C may therefore be regarded as the stage at which the whole becomes articulated. The whole begins to speak through its parts. It expresses itself in layers, branches, segments, edges, repetitions and local structures.

This makes Stage C particularly important for understanding form as a language. At Stage A, the language is still folded. At Stage B, the first letter or line appears. At Stage C, a grammar emerges: elements begin to combine according to rules. Centre, axis, branch, layer, facet, edge and fold no longer exist in isolation. They enter into relations. It is these relations that create form as a readable structure.

Stage C is also a phase in which complexity increases. Complexity must, however, be distinguished from complication for its own sake. Morphogenetic complexity performs an organising role. It enables a form to become more stable, functional, expressive, adaptive or meaningful. A leaf with veins distributes substances more effectively and supports its surface. A river network organises drainage more efficiently. A folded structure records the deformation of matter. An ornamental composition creates rhythm and meaning. Complexity becomes a form of order.

Excessive complexity, however, may lead to instability. If branching becomes uncontrolled, the form may lose its integrity. If fractures completely destroy a material, the structure disintegrates. If an ornament is overloaded, the composition loses its legibility. Stage C therefore requires a balance between differentiation and integration. The form must create distinctions while holding them together as a whole. This is one of the principal laws of morphogenesis.

Integration at Stage C is ensured in different ways. In biology, it is maintained by the regulation of growth, tissue connections and the functioning of the organism. In geology, it is maintained by continuity of strata, material properties, the stress field and relief. In the cosmos, it is maintained by gravity, gas dynamics, and magnetic and energetic interactions. In culture, it is maintained by compositional intention, canon, rhythm and a symbolic system. The mechanisms differ, but the morphological result is similar: a multilayered structure must remain whole.

Stage C is also associated with the concept of the module. A module is a repeating element of form that may be reproduced with variations. In a leaf, it may be a region between veins or a repeating serration along the edge. In a flower, it may be a petal. In a tree, a branch. In geology, it may be a repeating layer, fold or fracture block. In architecture, it may be a column, window, tier or façade element. In an ornament, it may be a motif. Modularity allows a form to be complex yet organised. It makes repetition manageable.

Modularity is closely connected with self-similarity. When a module repeats the principle of the whole, a fractal or fractal-like structure arises. When a module is repeated rhythmically, an ornamental or segmented structure emerges. When a module performs a function, a biological or technical organisation emerges. Stage C is the stage at which modules begin to form and become interconnected. It therefore prepares complete unfolding at Stage D, where the modular structure will be most fully visible.

The emergence of local centres is also important at Stage C. In a Id structure, there may be more than one centre. The principal centre or axis may generate secondary centres: branching nodes, growth points, intersections of veins, network nodes, fracture foci, compositional focal points or luminous condensations. These local centres do not negate the original centre, but make the structure more complex. The Matrix begins to reproduce the principle of centred organisation within the form itself. This is another aspect of its fractal logic.

Local centres are especially important to the transition into a new cycle. What at Stage C is a secondary node may later become the beginning of a new form. A branch may become the axis of further branches. A bud on a branch may become a new shoot. A tributary may possess its own network. A small fault may generate ramifications. An ornamental motif may become the centre of a new composition. Stage C thus already contains the preconditions for the future D → A transition. The multilayered structure prepares new seeds.

Stage C is also associated with peripheral activity. As a form develops, activity shifts from the original centre towards its edges, nodes, ramifications and local zones. This does not mean that the centre disappears; it means that morphogenesis becomes distributed. A leaf grows not only along its axis, but also at its edge. A tree develops through numerous buds and branches. A river network develops through tributaries and erosional margins. A cultural composition becomes more complex through peripheral motifs. The form becomes polycentric within its overall structure.

The polycentricity of Stage C is an important feature of mature unfolding. At the earlier stages, the form depends upon a single centre or direction. At Stage C, it begins to create a system of interconnected centres and peripheries. This increases complexity and stability, but also variability. In biology, it makes an organism adaptive. In geology, it makes the relief complex. In culture, it enriches a composition. In the cosmos, it produces a multinodal and inhomogeneous structure. Stage C therefore constitutes the transition from a simple centre to a network of relations.

In this sense, Stage C may be represented as a morphogenetic field. Gradients, lines, nodes, layers, edges, local centres and zones of activity arise within this field. The form can no longer be described by a single axis or contour. It requires mapping. It is necessary to see how the elements are distributed and connected, where the transitions lie, which regions are active, which have stabilised and which continue to develop. Stage C is the first stage at which a comprehensive morphological map of the form becomes necessary.

Stage C is particularly important to the future methodology of the hypothesis because it provides the largest number of features for analysis. It allows the type of branching, number of levels, character of layering, complexity of the edge, presence of facets, degree of self-similarity, distribution of local centres, presence of folds, modularity, rhythm, and relationship between the internal and external to be recorded. Whereas Stage A is difficult to observe and Stage B is highly transitional, Stage C provides rich material for comparative morphology.

It is at Stage C that comparative BIO–GEO–COS series can be constructed. A biological leaf, geological relief and cosmic nebula may be compared not as identical objects, but as structures exhibiting different types of layering, edge, branching, faceting and frontal organisation. Stone texture, a leaf network and an ornamental motif may be described in terms of recurrent lines and segments. A flower, mandala and shell-like nebula may be compared in terms of centred organisation, layers and periphery. In every case, however, the level of evidential support must be stated.

Stage C also permits a distinction between strong and weak correspondences. A strong correspondence arises when several structural features coincide: axis, branching, layer, edge, self-similarity and local centres. A partial correspondence occurs when only one or two features coincide. A weak analogy exists when there is merely a visual impression of resemblance. Such a scale is particularly necessary at Stage C, because complex forms can easily create an illusion of similarity. The method must distinguish genuine morphological proximity from accidental resemblance.

Philosophically, Stage C expresses the principle of manifested diversity. Whereas Stage A corresponded to latent unity and B to the first distinction, C is unfolded multiplicity. This multiplicity, however, is still in the process of becoming. It is not complete. It creates the world of form as a system of levels and relations. C may therefore be regarded as the stage of the cosmos in the ancient sense of the word—an ordered diversity arising from potential wholeness.

Stage C also demonstrates that form is neither pure unity nor pure multiplicity. It is unity passing through multiplicity. This is the profound philosophical meaning of the Matrix. The closed seed contains the whole in compressed form. The first unfolding establishes direction. The multilayered structure demonstrates that the whole can become a multiplicity of parts without losing their connection. Complete unfolding subsequently stabilises this multiplicity as a completed form. C is thus the stage at which unity learns to be multiple.

Aesthetically, Stage C is often especially expressive. It shows form growing, under tension and increasing in complexity. A young leaf, an opening flower bud, a branching fracture, folded rock, a developing ornament and a nebula with filaments and shells all possess a distinctive dynamic beauty. They are not static. They reveal a process. The aesthetics of Stage C is the aesthetics of becoming rather than completion.

For this very reason, Stage C can be difficult to describe. It is exceedingly rich. It contains numerous directions, levels, details and transitions. To avoid losing sight of the whole, the basic schema must be maintained: a centre or originating axis, layers, facets, branches, edges, local centres, self-similarity and interaction with the environment. These elements provide the framework of analysis. Without such a framework, Stage C becomes a chaotic description of complexity. With it, the stage becomes intelligible as the regular unfolding of the Matrix.

Stage C is also the stage at which the relationship between order and variability becomes most apparent. The general logic of the form is preserved, but its details become individual. A leaf has a type of venation, yet each leaf is unique. A river network obeys principles of drainage, yet each basin is individual. A fold possesses a geological logic, yet each massif has its own history. A nebula possesses a physical structure, yet every object is unique. An ornament may follow a canon, yet every execution has distinctive features. C therefore demonstrates that the Matrix produces not copies, but structurally related variants.

In this respect, Stage C is the key to understanding individuality within a universal model. The universality of the Matrix does not eliminate individual form. On the contrary, individuality arises through the realisation of universal principles under concrete conditions. Layer, edge, branch, facet, fold and module acquire a specific appearance on each occasion. Stage C therefore demonstrates how a universal invariant becomes a unique morphology.

Stage C also prepares Stage D. Complete unfolding is impossible without prior multilayered organisation. A mature leaf cannot arise without its venous network and edge. A flower cannot arise without layers of petals and the opening of the bud. A mature river network cannot arise without the formation of channels and tributaries. A complex cultural composition cannot arise without the organisation of its elements. D is therefore not a sudden result, but the stabilisation of what develops during C.

The transition from C to D occurs when the multilayered structure attains relative completion. The layers are coordinated, the branches distributed, the edges formed, the facets organised, the folds either unfolded or stabilised, and the surface or volume has acquired a stable configuration. The form becomes maximally manifest for the given cycle. It no longer merely develops, but functions, interacts, reproduces or transmits its principle further. This will be the subject of the next section.

Stage C in the A–B–C–D model thus denotes the phase of the multilayered structure. It is a stage of active differentiation in which the first unfolding becomes a complex organisation of layers, facets, branches, edges, folds, local centres, modules, and internal and external levels. At this stage, the Matrix manifests itself as a language of organised diversity. The form becomes multiscalar, self-similar, historical, interactive with its environment and individually variable.

Stage C is therefore the heart of the morphogenetic process. It is here that latent order becomes not merely visible, but complex; the first axis becomes a network; the boundary becomes an active edge; the layer becomes the memory of a process; the facet becomes an element of the surface; branching becomes distribution; the fold becomes a mechanism of internal depth; and local centres become the germs of future cycles. The next stage—D—will demonstrate how this multilayered structure reaches complete unfolding and becomes capable of reproduction.

8.4. Stage D: Complete Unfolding

Stage D in the A–B–C–D model denotes the phase of complete unfolding of form. Whereas Stage A was the closed seed, Stage B the first outward emergence of the internal, and Stage C the multilayered increase in structural complexity, Stage D is the moment of maximum manifestation. At this stage, the form attains relative completion: its axis, layers, facets, branches, edges, folds, surfaces, and internal and external levels are not merely indicated, but become visible, functionally connected and morphologically legible.

Complete unfolding should not be understood as absolute immobility or a definitive end. Within the hypothesis of the Unified Matrix of the Universe, Stage D marks the completion of a particular cycle, but not of the process as a whole. It demonstrates that the latent structure has passed from concentration to manifestation, from closure to openness, and from potentiality to organised form. Yet it is precisely upon reaching full manifestation that a form becomes capable

of a further transition: reproduction, transmission of an invariant, disintegration, transformation or the creation of a new seed.

The principal feature of Stage D is the maximum visibility of internal order. What was concealed at Stage A, had only begun to emerge at Stage B and grew more complex at Stage C now becomes available as a whole form. The internal becomes external. This does not mean that the form no longer possesses concealed levels. Every real form remains deeper than its external appearance. At Stage D, however, its fundamental morphological logic has become manifest: its centre, axis, periphery, layering, distribution, edge, rhythm and the relationship of the parts to the whole can be seen.

In biological examples, Stage D may be represented by a mature leaf, an open flower, a formed fruit, a developed branch or an entire plant at the stage of functional maturity. A mature leaf displays its axis, venous network, surface, edge, segments and, in some instances, folds and undulations. An open flower displays its centre, layers of petals, radial or other symmetry, colour, edge, texture and relationship to pollination and the subsequent cycle. A fruit shows a new concentration of the result, already prepared for seed formation. In each case, the form has attained a degree of expression at which its structure is manifest and functionally significant.

Stage D makes the distinction between unfolding and simple growth especially clear. A form may increase in size without being fully unfolded. Complete unfolding signifies not merely a quantitative increase, but the qualitative completion of a particular stage. A leaf becomes a leaf not simply when it is larger than a shoot, but when its surface, veins and edge are organised for exchange with the environment. A flower is fully open not because it is larger than the bud, but because its centre, petals, periphery and reproductive function have become accessible. Stage D is therefore a stage of functional and morphological maturity.

Stage D has a different character in geology. A geological form does not unfold like a plant or attain maturity in the biological sense. It is nevertheless possible to speak of the full manifestation of a structure within a particular process. A folded stratum, a formed fracture network, a mature river system, an exposed geological section, a developed coastline or a stable relief complex may all be considered Stage D of the relevant morphogenetic cycle. Here internal stresses, accumulations, layers, faults and processes become visible in the form of a surface, section or landscape.

A geological fold, for example, may still have been forming at Stage C, whereas at stage D it becomes a stable and legible structure. Its layers are curved, their sequence is visible, the direction of deformation can be reconstructed, and the form preserves the memory of pressure and time. At Stage D, a fracture network is no longer a single primary line, but a system of ruptures, edges, ramifications and blocks. A river network at Stage D possesses main channels, tributaries, basins, valleys and peripheral forms. In each case, Stage D displays not the beginning of a process, but its manifested result.

Stage D must likewise be understood cautiously in relation to cosmic material. A nebula, galactic structure, shell of gas and dust or star-forming region is not complete in an absolute sense. The cosmos is dynamic, and the observed form is always a stage within a process. At the morphological level, however, it is possible to speak of a state of maximum observable manifestation: the structure possesses a centre or several centres of activity, shells, fronts, filaments, edges, zones of differing brightness, layering and a distribution of matter. In such a state, it may be described as the unfolded form of a particular observational cycle.

It is especially important that cosmic Stage D should not be biologised. A nebula is not a flower, a galaxy is not a leaf, and a stellar cloud is not literally a seed. Their forms may nevertheless be included in comparative morphological analysis when the features being considered are centred organisation, shell-like organisation, filamentary structure, fronts, periphery, layering and the dynamics of matter. Here Stage D denotes not biological maturity, but a pronounced structural organisation that is accessible to observation and modelling.

In cultural systems, Stage D may be represented by a completed symbol, an unfolded mandala, a bas-relief, architectural composition, ornament, text, ritual schema or completed artistic image. The originating sign or centre, which at Stage A was a folded semantic core, acquired its first axis or direction at Stage B, and unfolded into tiers, elements and segments at Stage C, becomes a whole cultural form at Stage D. It may now be perceived, read, interpreted, reproduced or transmitted within a tradition.

Cultural Stage D has an important distinctive feature: the form unfolds not only as an object, but also as meaning. Architecture unfolds through a person's movement within space. A symbol unfolds through cultural knowledge. Ornament unfolds through the rhythm of perception. A text unfolds through reading. A bas-relief unfolds through iconographic and historical context. Complete cultural unfolding therefore always involves interaction between the object and the interpreter. A form may be materially complete, but its meaning unfolds only in the act of perception.

The wholeness of form becomes especially clear at Stage D. Here wholeness is no longer latent, as it was at Stage A. It is not merely nascent, as at Stage B, or still being formed, as at Stage C. It becomes a manifested system. The parts are distinguishable, but connected. The layers are related to one another. The branches retain their connection with the axis. The edge expresses both the internal structure and interaction with the environment. The facets form the surface of the whole. Local centres are incorporated into the general organisation. Stage D therefore displays form as coordinated diversity.

It is this coordination that distinguishes complete unfolding from a mere increase in complexity. At Stage C, the form may be highly differentiated, growing, variable and at times unstable. At Stage D, this complexity attains a certain stability. It does not disappear, but becomes organised. A leaf maintains its surface. A flower unfolds its composition. A river network acquires a stable basin. An ornament completes its rhythm. Architecture forms an integral space. A nebula displays an observable configuration of shells and fronts. Complete unfolding is not the absence of movement, but the relative stabilisation of structure.

The stability of Stage D is always relative. In living nature, a mature leaf ages, a flower withers, and a fruit ripens and disintegrates. In geology, relief is eroded, coasts change, and strata are exposed and weathered. In the cosmos, gaseous structures expand, disperse, contract or become involved in new processes. In culture, symbols are reinterpreted, architecture ages, and ornaments are transferred into new contexts. D is therefore not an eternal state. It is the moment of maximum formation within a continuing process.

Stage D is also associated with function. A fully unfolded form generally enters into its most active interaction with the environment. A leaf is unfolded towards light, air and moisture and for gas exchange. A flower is open to pollination, perception and reproduction. A fruit is prepared for seed dispersal. A river system transports water and material. A coastline interacts actively with both water and land. Architectural form is open to human movement and perception. Symbolic

form is open to reading and the transmission of meaning. An unfolded form is not merely visible; it acts.

This activity makes Stage D the phase of maximum involvement in the surrounding environment. At Stage A, the form was protected and relatively closed. At Stage B, it emerged for the first time. At Stage C, it increased in complexity through interaction. At Stage D, it participates fully in exchange. Exchange, however, also implies vulnerability. The unfolded form is accessible to its environment and is therefore subject to influence, change, damage, ageing and transformation. Complete unfolding always combines strength and vulnerability.

In this sense, Stage D has a dramatic character. It is the culmination of manifestation, but simultaneously the beginning of transition into the next state. A flower is beautiful precisely at the moment of opening, yet this moment already leads towards fruiting and withering. An exposed geological layer becomes visible, but simultaneously begins to erode. A symbol becomes available for interpretation, but may be reinterpreted or lost. Unfolding makes a form complete, but does not protect it from time. On the contrary, it exposes the form to time to the greatest possible degree.

The active edge becomes especially clear at Stage D. Here the edge is no longer the shell of Stage A or the first threshold of Stage B. It becomes the complex periphery of an unfolded form. In a leaf, it may be serrated, undulating, smooth, lobed or dissected. In a flower, it is expressed by the edges of the petals. In a geological structure, it may be a coast, scarp, line of exposure, fracture edge or stratal boundary. In a nebula, it may be a peripheral shell, filamentary front or boundary in the distribution of light. In a cultural form, it may be a frame, ornamental border, architectural contour or boundary of sacred space.

The edge is one of the principal zones through which a form may be read at Stage D. It reveals how the internal structure completes itself in external space. It records the rhythm of growth, resistance of the environment, stress, interaction and individuality. Whereas at Stage C the edge was actively forming, at Stage D it becomes a complete record of the interaction between form and the world. Stage D cannot therefore be analysed without analysing the edge.

Complete unfolding also makes layering visible. In the flower bud, the layers were concealed or only partially visible. In an open flower, they become evident as rows of petals, centre, periphery and depth. In a geological section, the strata become accessible to view. In a nebula, shells and fronts may be identified through observation. In architecture, tiers, façades and internal and external spaces acquire a completed composition. In a symbol, levels of meaning may be read through the structure of the image. Stage D is the stage at which layers become part of the manifested form.

Facets likewise acquire definition at Stage D. The surface has now been articulated into regions, faces, planes, fields and elements. In a crystal, faceting is manifested as faces. In a leaf, it appears as regions between the veins and segments of the surface. In relief, it appears as slopes and planes. In architecture, it appears as façade and spatial elements. In ornament, it appears as repeating fields and motifs. Faceting makes form legible as a complex whole composed of coordinated parts.

Branching also reaches maturity at Stage D. In a tree, it is expressed by the crown; in a leaf, by the venous network; in a root, by the developed root system; in a river, by the basin and its tributaries; in a fracture, by the network of ruptures; and in a cultural motif, by an unfolded system of ramifications. Branching becomes not merely a process of growth, but a stable configuration. At

this stage, the hierarchy of branches, order of levels, degree of self-similarity, network density and relationship between principal and secondary directions may be analysed.

Stage D is especially important for fractal analysis. It is in the completely unfolded form that the recurrence of structural principles at different scales becomes visible. In a mature leaf, the hierarchy of veins can be observed. In a tree, the repetition of branching can be seen. In a river system, the nested structure of channels is evident. In a fracture network, ruptures recur at different scales. In an ornament, the motif is repeated. In cosmic structures, distributed filaments, shells and local condensations may be observed where supported by observational data. Complete unfolding provides the material required to assess self-similarity.

The fractality of Stage D should not, however, be understood as absolute mathematical fractality. Real forms are finite and limited by their material, environment, function and history. Self-similarity at Stage D is therefore natural, approximate, restricted in scale and variable. This is precisely what makes it morphologically valuable: the Matrix manifests itself not as an ideal, infinite formula, but as the recurrence of a principle within a real, finite and concrete form.

Stage D is also the moment at which form becomes most accessible to comparison. A closed seed is difficult to compare with a geological or cosmic object without knowledge of the relevant processes. The first unfolding is often too brief and unstable. The multilayered structure of Stage C is rich, but still developing. At Stage D, however, the structure has become sufficiently manifest for its features to be compared: centre, axis, layers, facets, edges, branching, folds, rhythm, self-similarity and local centres. Many of the illustrative comparisons in this book will therefore concern Stage D.

Comparisons at Stage D must nevertheless be especially disciplined. Fully unfolded forms often have a striking appearance and may generate powerful visual associations. A flower may resemble a nebula, stone texture a leaf, a river network a tree, or an ornament a biological structure. Such similarities may be valuable to research, but they do not constitute evidence of a single physical origin. Within the Matrix hypothesis, they must be described as morphological correspondences of differing strength rather than as direct identities.

Stage D also makes it possible to identify which invariants are genuinely stable. If centred organisation, axiality, layering, an active edge, branching, self-similarity and cyclicity recur in different unfolded forms, this may support the hypothesis at the comparative-morphological level. If the similarity is limited to a general impression, it should be considered a weak analogy. Stage D therefore supplies material not only for demonstrating the hypothesis, but also for testing it.

In biological Stage D, the invariants are often clearly expressed. A leaf displays an axis, network and edge. A flower displays a centre, radiality, layers and periphery. A tree displays an axis, branching, local centres and cyclicity. In geology, the invariants may be expressed through strata, fractures, folds, edges, branching channels and relief networks. In the cosmos, they may be expressed through centres of activity, shells, fronts, filaments and peripheries. In culture, they may be expressed through compositional centres, axes, tiers, ornaments, frames and symbolic levels. The task of analysis is not to conflate these domains, but to recognise structural functions.

Complete unfolding is also associated with reproduction. In biology, this is self-evident: a mature form may participate in the creation of a new form. A flower leads to a fruit, a fruit to a seed, and a seed to a new cycle. In a broader sense, however, reproduction may mean the transmission of a structural principle. A geological form may disintegrate and become the material of new strata.

Cosmic matter may enter new structures. A cultural symbol may generate new images and meanings. The completed form becomes the source of further form generation.

Literal and morphological reproduction must be distinguished. Biological reproduction is associated with life, heredity and procreation. Geological ‘reproduction’ is the transformation of material and processes rather than reproduction in the biological sense. Cosmic ‘reproduction’ involves the redistribution of matter and energy. Cultural reproduction involves the transmission of images, signs, meanings and techniques. At the level of the Matrix model, however, all these processes fulfil a similar function: Stage D may generate a new A. What is complete may become potential. What has unfolded may be folded once again.

It is precisely the ability of D to pass Into a new A that makes Stage D not a finale, but a nexus within a cycle. If unfolding did not lead to a new seed, the A–B–C–D model would be linear. The Matrix hypothesis, however, presupposes cyclicity: A → B → C → D → A. Stage D must therefore always be considered from two perspectives. It completes the preceding unfolding while simultaneously preparing a new one. It is both flower and future fruit, mature structure and the source of subsequent potential, manifested order and the beginning of a new latent order.

The memory of form is especially important in this transition. The new seed does not repeat the preceding cycle absolutely, but carries its principle. A new layer arises from the material of the preceding form, but becomes part of another structure. A new symbol retains a motif, but unfolds it differently. A new cosmic process uses the matter and energy of preceding states. Stage D therefore transmits not only material, but also invariants. It preserves morphogenetic memory in a transformed form.

Stage D may also be a stage of crisis. Complete unfolding does not always take the form of harmonious flowering. Internal structure may become external through rupture, destruction, explosion, exposure, erosion or disintegration. A geological stratum is revealed in section because the surface has been destroyed. A fracture network reveals internal stress through rupture. A cosmic shell may be the trace of an explosive event. A damaged artefact may disclose layers of history precisely through loss. Complete unfolding may therefore be creative and dramatic at the same time.

This proposition is important to the breadth of the hypothesis. The Matrix must not describe only gentle, harmonious and aesthetically pleasing forms. Form generation includes stress, rupture, ageing, transformation and disintegration. Stage D may be maturity, but it may also be exposure. It may be flowering, but it may also be disclosure through destruction. In both cases, what was concealed becomes manifest. The difference lies in the mechanism and its consequences.

Complete unfolding is also associated with a limit. The form reaches the limit of a given cycle: the leaf is fully unfolded, the flower open, the fold flattened or stabilised, the fracture network formed, the layer exposed and the composition completed. This limit, however, is not an absolute end. It is a boundary of transition. Having reached its limit, the form either maintains itself for a time or begins to transform. Stage D therefore always contains a tension between completion and transition.

Philosophically, Stage D expresses actuality. What was possible at Stage A has become actual at Stage D. Yet this actuality does not abolish new possibility. On the contrary, it creates it. The fully unfolded form is both an actual structure and a potential beginning. It is actual as a result and potential as a source of a new cycle. This dual position makes D symmetrical with A: A is the latent possibility of a future form; D is a manifested form containing the possibility of new latency.

The cyclical logic of the Matrix is expressed in this symmetry. A and D are opposed yet connected. A is closed, compact, concealed and potential. D is open, unfolded, visible and functional. Yet D can generate A again. The end therefore returns to the beginning, although not mechanically. Between them lies the entire path of morphogenesis: the first unfolding, multilayeredness, the edge, the fold, interaction with the environment and individualisation. The new A already bears the history of D.

Stage D is also the stage of maximum individuality. At Stage A, different forms may resemble one another externally as closed seeds, nuclei, circles or condensations. At Stage B, their differences only begin to emerge. At Stage C, they are actively formed. At Stage D, individuality becomes most visible. Each leaf has its own edge, each fracture network its own pattern, each nebula its own configuration, and each artefact its own style and history. Complete unfolding reveals not only a universal invariant, but also a unique realisation.

This is especially important to an understanding of the relationship between the universal and the particular. The Matrix does not eliminate the particularity of form. It makes it possible to see how particularity arises on the basis of recurring principles. Centre, axis, layer, edge, branching and self-similarity may recur, but their concrete configuration is unique. Stage D is where the universal morphogenetic language speaks in an individual voice.

Methodologically, Stage D requires comprehensive description. In relation to an unfolded form, it is necessary to record its general structural type; centre or centres; axes and directions; layers and levels; facets and segments; branches and networks; character of the edge; folds and curves; degree of self-similarity; interaction with the environment; indications of completion; and possibility of transition to a new cycle. Only such a description makes it possible to understand D as a stage of the Matrix rather than merely as an external image.

Stage D also makes it possible to assess the strength of morphological correspondence between objects. If two objects possess a similar centre, axes, layers, edges and branching, the correspondence may be strong. If only the edge or general form coincides, it is partial. If the resemblance is based solely upon visual impression, it is weak. Analysis of D must therefore be parametric. This is especially important when working with illustrations, where visual persuasiveness may outpace rigorous argument.

Stage D may become one of the main visual supports for the hypothesis in this book. It is unfolded forms—the leaf, flower, stone structure, coastline, nebula, galactic form, ornament and bas-relief—that make it possible to demonstrate how morphological invariants are manifested in different domains. Each illustration, however, must be accompanied by a precise explanation of what is being compared, at what level, with what strength of correspondence and subject to which limitations. Otherwise, the unfolded form will become an arbitrary analogy.

Complete unfolding also has epistemological significance. It makes form accessible to knowledge. While a form remains closed, we see only its shell. When it unfolds, we acquire the possibility of analysing its structure. The unfolding of form, however, does not imply complete knowledge of it. Visible morphology must be supplemented by data concerning the process, material, function, history and environment. Stage D is therefore the beginning of more profound investigation, not its end.

This is especially important to the hypothesis of the Unified Matrix of the Universe. The visible similarity of unfolded forms may inspire the hypothesis, but its development requires methods: morphometry, classification of edges, analysis of layering, description of branching, assessment

of self-similarity, comparison across scales, testing of physical and biological mechanisms, and historical and cultural analysis of artefacts. Stage D supplies the material, but that material must be processed rigorously.

Stage D also displays the relationship between form and environment in its fullest expression. The form is no longer protected by a shell, nor is it only beginning to interact as it was at Stage B. It is fully incorporated into its environment. A leaf is open to light. A flower is open to pollination. A coast is open to waves. A fault is open to erosion and water. A nebula is open to the interstellar medium. Architecture is open to human beings, climate and the city. A symbol is open to culture. D is therefore the stage of maximum exchange.

Exchange at Stage D may be material, energetic, informational or semantic. In biology, it involves the exchange of substances and energy. In geology, it involves the exchange of material through erosion, transport and deposition. In the cosmos, it involves the exchange of matter, radiation and field dynamics. In culture, it involves the exchange of meanings, images and interpretations. These different types of exchange must not be conflated, but it may be recognised that an unfolded form always enters into relations. It becomes a node of interactions.

Stage D is therefore not only morphological, but systemic. At this stage, form does not exist as an isolated object. It is embedded within a wider process. A mature leaf is connected with the plant and its environment. A flower is connected with pollinators, fruit and seeds. A geological section is connected with the history of the Earth and future erosion. A cosmic shell is connected with the processes of matter and energy. An artefact is connected with culture, memory and interpretation. Complete unfolding makes the system visible.

At Stage D, it becomes especially apparent that form is a temporary configuration of a process. It appears stable, but constitutes a moment in a flow of change. This idea is important to the entire study. The Matrix does not describe eternal, motionless figures. It describes stages of becoming. D is not a frozen image, but a phase in which a process has attained a high degree of visibility and organisation. Change inevitably follows: preservation, ageing, destruction, reproduction, transformation or a new cycle.

Complete unfolding is also associated with transmission. A form at Stage D is capable of transmitting its principle further. Biological form transmits it through seeds, spores and reproduction. Geological form transmits it through material, strata, sediment and changes in relief. Cosmic form transmits it through the redistribution of matter and energy. Cultural form transmits it through memory, copying, symbols, texts, teaching and tradition. Transmission is what transforms a completed form into the beginning of the next process.

This capacity for transmission distinguishes Stage D from mere completion. A completed but isolated form might constitute a final state. A form capable of transmitting an invariant, however, becomes a link within a cycle. D should therefore be understood as maturity directed towards the future. It completes the past and opens what follows. In this sense, Stage D is the most temporally saturated stage: it displays past development, present unfolding and future potential.

Stage D may be described by several principal features. The first is the maximum external manifestation of structure. The second is the coordination of parts and whole. The third is the development of layers, facets, branches, edges and local centres. The fourth is active interaction with the environment. The fifth is functional or structural maturity. The sixth is individual morphological completion. The seventh is the capacity for reproduction, transmission or

transformation into a new A. These features distinguish D from C: C is still constructing complexity, whereas D manifests and stabilises it.

A mature leaf, for example, belongs to D when its surface is fully unfolded and its structure functions. An open flower belongs to D when its centre and petals are accessible to the reproductive cycle. A formed river network belongs to D when its channels and tributaries are organised into a stable basin. A geological fold belongs to D when it is expressed and can be read within the strata. An ornamental composition belongs to D when its centre, rhythm, fields and edges are complete. In each case, D is defined not only by form, but by the degree to which the process has been realised.

Stage D also helps us understand that completion may take different forms. There is biological maturity, geological manifestation, observable cosmic structure, cultural compositional completion and symbolic disclosure. These types of completion are not identical. All may nevertheless be regarded as forms of maximum manifestation within their respective types of system. D is thus a universal stage not because it possesses the same mechanism everywhere, but because it everywhere denotes a phase of complete structural manifestation.

Philosophically, Stage D is the moment at which form manifests itself to itself and to the world. What was folded becomes unfolded. What was concealed becomes distinguishable. What was potential becomes active. What was internal acquires an edge and periphery. D may therefore be called the stage of manifested order. It demonstrates that the Matrix does not remain an abstract principle, but becomes visible in concrete forms.

Manifested order is not, however, synonymous with complete transparency. Much is visible at Stage D, but not everything is understood. An open flower is visible, but its biochemistry and genetics require analysis. A geological fold is visible, but its history must be reconstructed. A nebula is visible in a processed image, but its physics requires spectral and dynamic data. An artefact is visible, but its cultural meaning requires historical research. Stage D opens form to knowledge, but does not substitute for knowledge.

This distinction is especially important to the scientific integrity of the hypothesis. The visibility of an unfolded form must not create an illusion that the hypothesis has been proven. The fact that an object beautifully displays elements of the Matrix does not demonstrate a universal law. It provides material for analysis, classification and further testing. Stage D is therefore both powerful and hazardous: it is visually the most persuasive stage, but requires the greatest methodological discipline.

Stage D also leads to the following section—the cycle of the new seed. Complete unfolding alone does not complete the A–B–C–D model. It must be shown how D returns to A; otherwise, the schema remains linear. The principal meaning of Stage D is therefore revealed only in the prospect of transition: the mature form must either produce a new seed, become the material of a new structure, transmit its invariant in another form, or enter into a new process. D is not a point, but a turning.

Stage D in the A–B–C–D model thus denotes the complete unfolding of form. It is the phase in which internal structure becomes external to the greatest possible degree—visible, functionally active and morphologically legible. The form attains relative completion, displays its layers, facets, branches, edges, folds, rhythms and local centres, enters into intensive interaction with the environment and becomes capable of transmitting its principle.

Complete unfolding is therefore not an end, but the mature phase of a cycle. Stage D completes the path from the closed seed to manifested form while simultaneously preparing the return to a new A. In biology, this is expressed through fruit and seed; in geology, through disintegration and new accumulation; in the cosmos, through the transformation of matter; and in culture, through the transmission of image and meaning. Stage D must therefore be understood as the culmination of manifestation and the beginning of a new folding. The following section is devoted precisely to this transition: the cycle of the new seed.

8.5. The Cycle: A New Seed

The A–B–C–D model cannot be understood as a simple linear sequence. If it is regarded solely as a movement from the closed seed to complete unfolding, the morphogenetic process remains incomplete. The form reaches Stage D and becomes visible, mature and structurally expressed, but the subsequent logic remains unclear. Within the hypothesis of the Unified Matrix of the Universe, a different proposition is fundamental: Stage D is not an absolute end. The completed form returns the process to a new beginning. Complete unfolding becomes the condition of a new seed.

It is here that the A–B–C–D model becomes a cycle. Stage A denotes the closed seed, Stage B the first unfolding, Stage C the multilayered structure and Stage D the complete manifestation of form. After D, however, a new A arises. The completed form may once again fold its result into a potential state. This new seed is not identical to the first. It carries the memory of the preceding cycle, but enters a different time, environment and context, and a new range of possibilities. The cycle of the Matrix is therefore not a mechanical circle, but a spiral return.

This logic is most evident in biological development. A seed germinates and produces a shoot, stem, leaves, branches, bud, flower and fruit. The flower or fruit represents the stage of complete manifestation while simultaneously preparing a new seed. A plant does not simply unfold a form for the sake of its external completion. It creates the possibility of continuation. In this sense, the new seed is not an incidental addition to the mature form, but the internal outcome of the entire cycle. The whole unfolding is directed towards enabling the unfolded form to transmit its principle further.

This return to the seed is not, however, a return to the same point. The new seed is connected with the preceding cycle, but does not coincide with the original seed. It may carry the hereditary, structural, environmental and individual consequences of the preceding development. It is incorporated into a new situation. The formula ‘seed → unfolding → branching → reproduction → new seed’ should therefore be understood as a formula of development with memory. Each new cycle repeats the general principle, but does not reproduce the previous form absolutely.

This distinguishes the cycle of the Matrix from a simple closed circle. A circle returns to the beginning as the same point. A spiral returns to the beginning at a new level. Within the hypothesis of the Unified Matrix of the Universe, the spiral cycle is therefore a more accurate image: form returns to potentiality after passing through unfolding, increasing complexity, interaction with the environment, individualisation and the transmission of an invariant. The new seed is the folded result of the preceding unfolding and the beginning of a future unfolding.

The transition D → A is one of the most important moments in the entire model. It demonstrates that a completed form is capable not only of existing, but also of transmitting. Transmission may be biological, material, structural, energetic, informational, cultural or symbolic. In biology, it occurs through seeds, spores, reproduction and heredity. In geology, it occurs through the disintegration of rocks, transport of material, sedimentation and the formation of new strata. In the cosmos, it occurs through the redistribution of matter and energy and the participation of Matter in new structures. In culture, it occurs through signs, images, texts, tradition, interpretation, imitation and creative transformation.

These types of transmission must not be conflated. A biological seed and a cultural symbol are not the same. Rock sediment and a plant seed operate through different mechanisms. Cosmic matter does not reproduce like a living organism. At the level of morphological function, however, they may be compared: a completed form becomes the source of subsequent form generation. It is this function that makes it possible to speak of a new seed in an extended sense. A new seed is any state in which the result of a preceding cycle again becomes a potential beginning.

In biology, a new seed literally contains the possibility of a future organism. In geology, the new seed may be material from which a new layer, relief or structure will form. Disintegrated rock becomes sediment; sediment is compacted; a new stratum arises; the stratum is subjected to pressure and may subsequently be exposed in a fold, fault or relief form. This process involves no biological reproduction, but it does involve the cyclicity of matter and form. The geological cycle demonstrates that the destruction of one form may become the beginning of another.

In cosmic processes, the new seed also has a distinctive meaning. Following the completion of a particular stage, matter does not disappear from the world of forms. Gas, dust, heavy elements, shock waves, regions of density and the remnants of stellar processes may participate in further structuring. A cosmic form may disperse, but its matter becomes incorporated into new configurations. Here the new seed is not the germ of life, but a new state of matter capable of forming the basis of subsequent processes. The cosmic cycle of the Matrix should therefore be understood as a cycle of transformation rather than a biological cycle of reproduction.

In culture, the new seed arises through memory and meaning. A completed symbol, bas-relief, ornament, architectural form or text may become the source of new images. It is preserved, copied, reinterpreted, incorporated into other traditions and transformed into a motif, schema, sign, theme or canon. In this sense, after unfolding, cultural form is folded once again into a seed—an image that can be unfolded anew. The cultural new seed is not material in the biological sense, but it possesses semantic and compositional potential.

It is especially important that the new seed always involves selection. Not every completed form becomes the beginning of a new cycle. Not every flower produces viable seeds. Not every geological fragment participates in the formation of a new stratum. Not all cosmic matter becomes part of a new stable structure. Not every symbol continues within culture. The D → A transition is therefore not automatic. It requires suitable conditions, an environment, the preservation of an invariant and a possibility of transmission.

This qualification protects the hypothesis from excessive universalisation. It cannot be asserted that every form necessarily produces a new form. Some forms disappear, disintegrate, lose structural continuity or are destroyed without continuation. If, however, a form is capable of transmitting its principle, material, structure or meaning, it enters into the cycle of the Matrix. The

new cycle is therefore not a mechanical necessity, but a morphogenetic possibility realised under particular conditions.

The transition to a new seed demonstrates that the Matrix involves not only a process of unfolding, but also a process of folding. At the earlier stages, the movement was from closed to open: A → B → C → D. After D, an inverse logic begins: the unfolded form once again concentrates its result. The flower becomes the fruit, and the fruit the seed. Disintegrated rock becomes sediment, and sediment a new layer. A cultural composition becomes a motif, and the motif a new image. What has unfolded becomes folded once again. This folding does not negate the unfolding; it preserves its principle in compact form.

The Matrix thus operates through an alternation of unfolding and folding. First the form is concealed, then it unfolds, becomes more complex, reaches complete manifestation, and is subsequently concentrated again in a new beginning. This alternation may be called the breathing of form. It is not metaphysical breathing in a mystical sense, but the rhythm of morphogenesis: inward and outward, foldedness and unfolding, centre and periphery, periphery and a new centre, potential and manifestation, manifestation and a new potential.

Memory is a crucial element of this cycle. If the new seed were entirely unconnected with the preceding cycle, the model would lose its meaning. In real processes, however, a new cycle usually preserves traces of what preceded it. A biological seed carries hereditary and species-specific information. Geological sediment carries material and traces of the eroded rock. Cosmic matter carries the history of physical transformations. A cultural motif carries the memory of the preceding image, even when it is reinterpreted. The new seed is therefore memory folded into possibility.

Memory in this model need not be conscious. In biology, it is associated with heredity and the regulation of development. In geology, it is associated with material structure, composition, layering and traces of processes. In the cosmos, it is associated with the physical state of matter and the distribution of energy. In culture, it is associated with historical, symbolic and textual memory. In every case, memory signifies that a new beginning does not arise from absolute emptiness. It inherits something from the preceding cycle.

Memory is not, however, the same as repetition without change. If the new seed simply copied the past in its entirety, development would be mechanical. In reality, memory is combined with variability. A seed preserves a type, yet every new plant is individual. Sediment preserves material, yet the new rock forms under different conditions. A symbol preserves a motif, yet a new culture may give it a different meaning. Cosmic matter becomes incorporated into new structures. The new seed is therefore a unity of memory and openness.

In this sense, the cycle of the Matrix may be described as the reproduction of an invariant through variation. An invariant is neither a completed form nor an exact copy, but a stable principle of organisation: centre, axis, layer, branching, edge, fold, self-similarity, and the transition from concealed to manifest and back to concealed. Variation is the concrete realisation of this principle in new material, at a new scale, within a new environment and at a new time. The new seed preserves the invariant, but opens the possibility of variation. It is in this way that the Matrix connects universality and individuality.

The formula of the cycle may be represented as follows: closed potentiality—first unfolding—multilayered increase in complexity—complete manifestation—new folding—a new seed. More concisely: seed → unfolding → branching → reproduction → new seed. This shorter formula must

not, however, obscure the process's internal complexity. Between the seed and the new seed lies the entire history of the form: threshold, axis, asymmetry, growth, layers, facets, edges, folds, environment, function, individuality and transmission.

The transition to a new seed is also associated with the problem of scale. A new cycle may begin at the same level, or it may pass to another. A plant seed produces a new organism at the same biological level. A branch may become the basis of further branching within the same organism. A fallen leaf becomes part of the soil and participates at a different level of a natural cycle. A geological fragment may become part of a new sedimentary layer, thereby passing to a different structural scale. A cultural motif may pass from a small ornament into an architectural composition, or from an ancient symbol into a modern philosophical model. The new seed therefore does not always continue the cycle in the same form or at the same level.

This is especially important to a fractal understanding of the Matrix. Parts of a completed form may become centres of new cycles. The branch of a tree bears buds from which new shoots develop. A leaf has veins, each of which may be the centre of a local network. A river system contains tributaries, each possessing its own basin. An ornament contains motifs, each of which may be repeated and unfolded. A new seed may therefore arise not only after completion of the whole form, but also within the form itself as a local centre of future unfolding.

This means that the A–B–C–D cycle may be nested. A large cycle contains smaller cycles. A plant as a whole passes through one cycle, while its leaves, buds, flowers, fruits and seeds possess cycles of their own. A geological system includes cycles of strata, fractures, erosion, transport and accumulation. A cultural form includes cycles of creation, perception, interpretation, copying and reinterpretation. A cosmic structure includes nested processes of matter and energy. The Matrix is therefore not a single circle, but a system of nested cycles.

The nested nature of the cycles strengthens the idea of self-similarity. If the same logic—closure, unfolding, increasing complexity, manifestation and new closure—recurs at different levels, the Matrix acquires a fractal character. Precision must nevertheless be maintained here: the issue is not strict mathematical self-similarity, but the recurrence of a morphogenetic principle. The smaller cycles do not copy the larger cycle in its entirety, but reproduce its principal relations. This constitutes the natural and cultural fractality of the process.

The new seed also demonstrates that the periphery may become a centre. At Stage D, a form possesses a developed periphery: edges, branches, fruits, fragments, motifs, broken pieces and local nodes. New cycles often begin precisely from these peripheral elements. A seed does not arise in an abstract centre of the plant, but as the result of the complex unfolding of flower and fruit. A new shoot may arise from a bud on a branch. New sediment may arise from the eroded periphery of a mountain or coast. A new cultural meaning may arise from a detail in an old image. In the cycle of the Matrix, therefore, the periphery is not a final margin; it may become a new centre.

This proposition has important philosophical significance. Centre and periphery are not permanently fixed roles. During development, they may exchange places. What was an edge becomes a beginning. What was a part becomes a whole. What was a result becomes a cause. What was unfolded becomes folded. The cycle of the new seed demonstrates the dynamic nature of morphological relations. The Matrix does not fix the world within an immobile hierarchy, but describes transformations of roles.

The D → A transition is also associated with death and transformation. In the biological cycle, a new seed frequently arises alongside the ageing and death of previous forms. A leaf falls, a flower withers, a fruit disintegrates, and a plant may complete its life cycle. In geology, the destruction of rock is the condition of new sediment. In culture, an old symbol may lose its previous context but become the basis of a new meaning. The new seed therefore often arises not only from growth, but also from disintegration. Under particular conditions, disintegration is not opposed to morphogenesis, but becomes part of it.

Not every instance of disintegration, however, is the beginning of a new cycle. If a structure is destroyed without transmitting material, an invariant or meaning, the process may be interrupted. Within the Matrix model, transformation must therefore be distinguished from disappearance. Transformation preserves the possibility of a new form. Disappearance loses this possibility or renders it inaccessible. In practice, the boundary between them may be difficult to establish, but it is theoretically fundamental. A new cycle arises where the result of a preceding form can be incorporated into further becoming.

The new seed is also associated with the compression of information. In a biological seed, the complexity of the plant is not contained as a completed miniature, but the basic conditions of future development are compressed within a particular organisation. In a cultural symbol, a complex myth or cosmology may be compressed into a single sign. In a scientific model, a complex process may be compressed into a schema. In a geological fragment, the history of rock may be compressed into a layer, inclusion or texture. Such compression does not mean simplification into emptiness. It is the translation of unfolded complexity into a compact medium.

In this sense, the new seed is a form of morphological compression. An unfolded structure cannot pass completely into a new cycle in its previous unfolded state. It must be compressed, selected and transformed. A seed preserves not the entire plant, but the principle of its renewal. A symbol preserves not the whole of a culture, but a key image or structure. Sediment preserves not the entire mountain, but its material and traces of processes. The new seed is therefore always selective. It carries what is essential, but not everything.

This selective preservation leaves the cycle open to change. Because the new seed does not contain a complete copy of the previous form, its subsequent unfolding may differ. The environment, contingent conditions, interactions, internal variations and new connections influence the next cycle. The Matrix is therefore not a programme of absolute repetition. It is a programme for renewing a principle. Each new cycle repeats the structure of becoming, but need not repeat the previous result.

This is especially clear in culture. The same symbol may be unfolded differently in different periods. The World Tree, circle, spiral, mandala, winged figure, bas-relief composition or ornamental motif may pass between contexts, preserving a morphological invariant while changing its meaning. The new seed of culture may be a small motif, fragment, line or image that subsequently unfolds into a large system. This demonstrates that the cultural Matrix operates through memory, variation and interpretation.

In geology, the new seed may be associated with a fragment of matter. An eroded rock becomes particles; the particles are transported, deposited and compacted, and become a new layer. This new layer may subsequently be uplifted, folded, exposed and eroded. The cycle is vast in temporal scale, but its morphological logic is preserved: form unfolds, disintegrates, folds into material and subsequently becomes form once again. The geological new seed has no internal programme of life, but it possesses material and processual continuity.

In the cosmos, a similar logic is expressed on an even greater scale. Matter that has passed through stellar and interstellar processes may become incorporated into new clouds, stars, planetary systems, shells and structures. Here the new seed is not a compact biological object, but a state of matter, density, energy or field capable of becoming the beginning of new structuring. The cosmic cycle demonstrates that the Matrix may be understood as a logic governing the transition of matter between states of concentration and unfolding.

Despite all these comparisons, the differences between mechanisms must be remembered. The biological cycle is based upon life and heredity. The geological cycle is based upon the physical and chemical processes of the Earth. The cosmic cycle is based upon astrophysical processes. The cultural cycle is based upon human memory and interpretation. The Matrix does not abolish these differences. It creates a language in which morphological functions may be compared: concentration, unfolding, increasing complexity, manifestation, transmission and new beginnings.

The cycle of the new seed also clarifies the concept of universality. The universality of the Matrix does not mean that all objects follow the same path through identical mechanisms. It lies in the recurrence of a structural situation: form may be folded, unfolded, made more complex, manifested and folded once again into a new potentiality. This situation occurs in different domains, but is realised in each through its own material, physical, biological or cultural conditions.

The A–B–C–D model must therefore be used as a schema of analysis rather than as dogma. It helps us ask questions: where is Stage A here? How did the first unfolding occur? Which elements formed Stage C? How is Stage D expressed? In what way may the result pass into a new A? If these questions cannot be answered, applying the model is questionable. If answers are available and grounded in observable features, the model becomes productive.

The cycle of the new seed is also important to understanding the development of the hypothesis itself. The hypothesis begins with the image of the circle-seed, unfolds into a system of concepts, grows more complex through biological, geological, cosmic and cultural comparisons, attains a theoretical form and may subsequently become a new seed for further research. In other words, the theory itself follows a morphogenetic path. It folds numerous observations into a model, unfolds the model into concepts, increases its complexity through material and then transmits it as a research programme.

This is not merely a literary device. Every scientific or philosophical model has a similar dynamic. First, a core idea arises. It then receives its first expression. Subsequently, it grows more complex and precise, and acquires methods, examples and limitations. It then becomes a mature theoretical construct and may generate new research. In this sense, the A–B–C–D model is not only an object of research, but also a way of understanding its own construction.

The new seed is also connected with the criterion of a form’s viability. Not every completed form is capable of continuation. In biology, the viability of a seed is tested through germination. In culture, the viability of a symbol is tested by its capacity to generate new meanings. In science, the viability of a hypothesis is tested by its capacity to generate research, methods, questions and testable results. In geology and cosmology, viability in the biological sense is inapplicable, but it is possible to speak of the capacity of material or a structure to participate in subsequent processes. The new seed is therefore always associated with the possibility of continuation.

For the hypothesis of the Unified Matrix of the Universe, this means that a completed model must remain open to testing and development. If it becomes closed within itself and claims to explain everything without distinctions, it will cease to be scientifically and philosophically productive. It must retain the capacity to generate new questions, classifications, comparisons, morphometric procedures, illustrative series and critical refinements. In this sense, the theory itself must become a new seed rather than a closed dogma.

The cycle of the new seed also demonstrates that the completion of a chapter or section is not the completion of the entire subject. Each formulated category—the circle, seed, axis, layer, facet, edge, fold, unfolding and new seed—may become the beginning of a separate study. This is how the theory branches. The basic model creates new local centres. Each local centre may be unfolded into its own chapter, method, comparative analysis or illustrative series. This accords with the logic of the Matrix itself: an unfolded structure generates new seeds within itself.

Another important consequence of the cycle is the rejection of finalism. Complete unfolding should not be understood as an ultimate goal towards which everything inevitably tends. In reality, processes may stop, deviate, disintegrate or pass into other forms. A new seed may arise, or it may not. A cycle may be interrupted, altered, transformed or nested within another cycle. The A–B–C–D model therefore describes not an iron necessity, but a typical morphogenetic trajectory.

This trajectory is especially useful as an analytical framework. It makes it possible to see form in time. Instead of considering an object as a static image, we ask: from what closed state might it have arisen; how did the unfolding begin; how was multilayeredness formed; how was manifestation attained; and what may become a new beginning? This approach transforms morphology from a description of outward appearance into an investigation of process. This is one of the principal aims of the hypothesis.

The cycle of the new seed also helps to unite the preceding chapters. The chapter on the circle-seed described Stage A. The chapter on leaf-like unfolding demonstrated the transition through B and C towards the unfolded form. The sections on the layer, facet, edge and fold revealed the mechanisms through which complexity increases. Stage D demonstrated complete manifestation. The cycle of the new seed now connects all these elements within a single system. Without this section, the model would remain incomplete because it would not show how a completed form becomes a beginning.

The principal philosophical meaning of the cycle is that form does not disappear upon completion. It either transmits itself, transforms, becomes material or enters into memory. The world of forms exists not as a succession of isolated, completed objects, but as a network of transitions. Every form may be the result of what preceded it and the condition of what follows. The Matrix therefore describes not only form, but the continuity of forms.

This continuity is especially important to an understanding of the relationship between part and whole. A new seed is often a small part of a completed form, yet it may become the beginning of a new whole. This reveals a profound fractal logic: the part carries the possibility of the whole, the whole generates parts, and the parts become new centres. The A–B–C–D → A cycle therefore does not merely repeat itself; it branches. It creates not a single line, but a network of potential continuations.

In the biological model, this is evident in the multiplicity of seeds, buds and shoots. A single plant may produce many new beginnings. In geology, one disintegrated massif may supply material to

numerous depositional environments. In culture, one symbol may generate many interpretations. In scientific theory, one model may generate numerous directions of research. The new seed therefore often appears not in the singular. A completed form may divide into multiple potentialities.

This multiplicity of seeds is especially important to an understanding of complexity. The cycle of the Matrix does not always resemble a single closed circle. It may be a branching cycle in which D generates several instances of A, each beginning its own trajectory. The A–B–C–D model should therefore be supplemented by the concept of multiple new beginnings. In nature and culture, completion frequently returns a process not to a single point, but distributes its potential among many points.

Such distribution does not negate the Matrix. On the contrary, it reveals its more complex operation. The original seed may become a plant, and the plant many seeds. A single line may become a network, the network many nodes, and the nodes new centres. A single cultural form may become a tradition, and that tradition many variants. The Matrix is therefore not only cyclical, but generative. It produces new possibilities.

The cycle of the new seed also clarifies the relationship between preservation and novelty. Without preservation, there would be no continuity. Without novelty, there would be no development. The new seed unites both principles. It preserves the structural principle, but remains open to a new unfolding. It carries memory, but does not exhaust the future. Stability and uncertainty therefore coexist within it. This is what makes the cycle alive in the broad morphogenetic sense.

Within the Matrix hypothesis, it may be said that the new seed is the point of maximum compression of previous experience and maximum openness to the future. The past has already been folded within it, while the future has not yet unfolded. It stands at the boundary between cycles. The new seed therefore repeats Stage A, but with new content. It is not the original seed, but the seed after the journey. It bears the trace of unfolding, even if this trace is not externally visible.

The circle of the A–B–C–D model is thus completed. Yet this completion does not close the system. It opens the next turn. A becomes B, B becomes C, C becomes D, and D becomes a new A. Each stage performs its own function: A preserves potential; B initiates unfolding; C produces multilayeredness; D manifests form; and the new A transmits the invariant. The model as a whole describes a process in which form arises, unfolds, becomes more complex, becomes visible and is concentrated once again into possibility.

The cycle of the new seed is therefore the concluding element of the A–B–C–D model. It demonstrates that morphogenesis does not end with the complete manifestation of form. A completed form is capable of returning the process to its beginning, but at a new level of complexity. The seed passes into unfolding; unfolding into branching and multilayeredness; multilayeredness into complete form; complete form into reproduction, transformation or transmission; and a new seed then arises. This sequence expresses not mechanical repetition, but the spiral continuity of form.

The A–B–C–D model makes it possible to describe the Matrix as a processual schema. It connects potentiality, unfolding, increasing complexity, manifestation and the new cycle. Stage A shows the closed seed; Stage B the first outward emergence of the internal; Stage C the formation of a multilayered structure; Stage D complete unfolding; and the D → A transition the return to a new

potentiality. Within this schema, form is understood not as a static object, but as a path: from latent order to manifested diversity, and from manifested diversity to a new latent order.

It is precisely this cyclical model that makes the hypothesis of the Unified Matrix of the Universe not a collection of visual analogies, but an attempt to describe a universal logic of morphogenesis. The model may subsequently be applied to different groups of objects—biological, geological, cosmic and cultural—while necessarily taking account of differences between mechanisms, levels of evidential support and limits of interpretation.

Part Three

The Biological Level of the Matrix

Chapter Nine

The Flower as a Local Model of the Universe

9.1. The Bud as a Closed Matrix

Moving to the biological level of the Matrix makes it possible to examine the hypothesis of the Unified Matrix of the Universe through material in which morphogenesis is manifested with particular clarity. Plant form displays all the principal elements described in the preceding chapters: the closed seed, the first unfolding, the axis, layers, folds, edge, radiality, fractality, reproduction and a new cycle. The flower occupies a special place among plant structures because the process through which form unfolds is represented within it in an exceptionally expressive manner. Before discussing the open flower, however, it is necessary to consider its closed state—the bud.

In this chapter, the bud is considered not only as a botanical object, but also as a local model of the closed Matrix. It represents a state in which the future form already exists but has not yet fully unfolded. The petals, centre, layers, axis, radiality, edge and colour structure remain concealed within a compact, shell-like form. Outwardly, the bud may appear simple, closed, oval, rounded, conical or rosette-like; within it, however, the complex architecture of the future flower has already been prepared. The bud is therefore one of the clearest biological images of Stage A in the A–B–C–D model.

The future form is compressed within the bud. It is neither an empty shell nor an indeterminate mass. The bud contains folded petals, the flower's developing organs, concealed layers, an internal centre and a potential radial organisation. What will later become an open, brightly coloured, multilayered structure with a complex periphery is held within the bud in a compact state. The bud may be understood as a form whose unfolding has already been prepared but is still being delayed. It preserves the future flower in a state of protected potentiality.

This feature is particularly apparent in images of closed buds, where the external form resembles a small enclosed body, although the overlapping lines of the petals already suggest an internal layering (Fig. 1). In some buds, the petals are tightly joined and the future radiality is barely visible. In others, the outer layers are already beginning to separate, revealing the direction of the future unfolding. Such intermediate states are important because they present the bud not as an immobile object, but as a phase within a process.

The bud is a closed Matrix because its future form exists in a folded state. Here the concept of the fold arises once again. The petals are not absent; they are folded. The edges have not disappeared; they are concealed within. Radiality has not been fully manifested; it is contained within a closed composition. The centre of the flower is not yet open to external view, but the entire future structure is already organised around it. The bud is therefore not only the beginning of the flower, but also an image of latent order.

Shell-like organisation plays a particular role in understanding the bud. The outer petals, sepals or other covering structures perform a protective function. They separate the flower's internal space from the environment, hold the folded form together, protect it from premature opening and create the conditions required for maturation. In this sense, the bud continues the logic of the seed, but at a new level. The seed contains the future organism in an initial state of potentiality, whereas the bud contains the future flower within a plant that is already developing. This is not the first stage of the entire life cycle, but a local Stage A within the plant's larger cycle.

This nested character of the bud is extremely important. The Matrix operates not only at the level of the plant as a whole, but also within its individual organs. The plant itself develops from a seed, but new 'seeds of form' subsequently arise within it: buds, flower buds, ovaries, fruits and new seeds. The flower bud is one such local centre of morphogenesis. It demonstrates that Stage A may recur within an already unfolded structure. A branch, leaf, flower and fruit may each possess its own small cycle of unfolding. This supports the fractal and nested logic of the Matrix.

Images of succulents and rosette-forming plants reveal particularly clearly the bud's affinity with the model of a closed or partially closed Matrix (Fig. 2). A succulent rosette is often composed of densely arranged, fleshy leaves that form a centred, spiral or radially layered structure. Such a form is not a flower bud in the strict botanical sense, but morphologically it displays a similar principle: a centre, layers, overlapping elements, dense packing and gradual unfolding towards the periphery. A succulent may therefore be used as an additional visual model of a closed or partially unfolded plant order.

Precision must nevertheless be maintained. A succulent rosette must not be identified with a flower bud. They differ in function, structure and biological meaning. At the morphological level, however, they may be compared as structures in which form is organised around a centre, elements overlap in layers, and the periphery gradually reveals the internal order. Such a comparison belongs to the comparative-morphological level; it does not assert complete biological identity.

The bud also demonstrates that a closed form may be highly complex. External compactness can conceal a high degree of internal organisation. When a bud is examined in section or as a sequence of unfolding, it becomes clear that it contains rows of petals, centres, axes of symmetry, possible spiral or radial relations, and distinctions between internal and external elements. The simplicity of the bud is therefore only external. Its internal structure already belongs to the future multilayered form.

Within the A–B–C–D model, the bud occupies the position of Stage A in relation to the flower. This means that it is the closed seed of floral form. It is important to emphasise, however, that the bud is not the absolute beginning of the plant. It has itself arisen through preceding morphogenesis—from stem growth, node formation, tissue development and bud differentiation. The flower bud is therefore simultaneously the outcome of one process and the beginning of another. It already belongs to Stage C or D of the plant organism as a whole, but becomes a new A within the floral cycle. This demonstrates the nested character of morphogenetic stages.

This shift is particularly important to an understanding of the universality of the Matrix. The same structure may perform different functions at different scales of analysis. For the plant as a whole, the flower bud forms part of an unfolded structure. For the flower, it is a closed Matrix. In relation to the future fruit, the flower will become a stage of unfolding. In relation to the seed, the fruit will again become the protective shell of a new beginning. A stage is therefore not an object's

permanently fixed property. It is determined by the object's position within a specific morphogenetic cycle.

The bud contains the future radiality of the flower. In its closed state, this radiality may not be apparent. The petals overlap, the centre is concealed, and the external surface may appear almost smooth or only slightly ribbed. When the bud opens, however, it becomes evident that the elements were organised around a centre. The bud is thus a form of latent radiality. It demonstrates that a centred structure may exist before becoming visually manifest.

This is directly related to the concept of the hidden axis. In an open flower, the vertical axis may visually dissolve into the radial arrangement of the petals. The observer sees primarily the circle, centre and periphery. In the bud, however, the axis is often more clearly expressed: there is a base, apex, direction of growth and vertical compactness. The bud demonstrates that the flower's radial form does not arise without axial preparation. Before the flower unfolds into a plane or cup, it exists as a vertically organised closed structure.

It is important here to distinguish between the morphological axis and the visual axis. The morphological axis is associated with growth, attachment, direction of development and internal organisation. In an open flower, it may be concealed or almost visually imperceptible. The bud allows this axial preparation to be seen. It holds the flower, as it were, in a state of vertical compression from which radial unfolding will subsequently arise. The bud is therefore a transitional form between axiality and radiality.

In this respect, the bud may be compared with a closed fan. While the fan is folded, its future breadth and radial organisation remain concealed within a narrow form. When it is opened, its individual ribs spread out around an axial centre. A bud operates differently because it is a living biological structure rather than a mechanical object, but the morphological analogy is useful: a future multiplicity of elements may be temporarily gathered into a compact form. Unfolding makes this latent multiplicity visible.

The petals within the bud are in a state of overlapping. They are not yet presented as independent elements of the open flower. They still act as layers of a closed structure. Their edges may be concealed, compressed, folded inwards or partly covered by neighbouring petals. As the bud opens, each petal begins to separate as a visible element. What was previously an internal layer becomes an external part of the flower. The bud therefore helps to explain the subject of Section 9.3: a petal may indeed be interpreted as a former layer.

The layer within the bud has a dual character. On the one hand, it protects the internal structure: the outer layers cover the inner ones. On the other, the layer is preparing to become a visible part of the open form. In the open flower, the petals no longer resemble closed shells; they become independent elements of the periphery. This transformation of a layer into a petal is one of the clearest biological examples of the transition from the latent to the manifest.

The bud also demonstrates that the edge of a form may exist before it is unfolded. The edge of a petal within the bud is often concealed inside the overall shell-like form. It does not yet interact with the environment as the edge of an open flower does. Yet it already exists. It already possesses a form, direction and line of future contact with external space. When the bud opens, this concealed edge becomes an active periphery. The bud thus contains not only future layers, but also future edges.

Images of closed floral structures clearly reveal that, even before unfolding, the bud's surface often possesses lines, grooves, overlaps, seams, curves, ribs or transitions of colour (Fig. 3).

These features are not random. They reveal how the internal structure is already beginning to manifest itself on the external shell. They may sometimes suggest the number of petals, the direction in which they overlap, or the future radial or spiral organisation. The bud does not therefore conceal the Matrix completely; it provides the first indications of its internal architecture.

This is especially important to morphological analysis. A closed form is not necessarily entirely opaque. It may display traces of its latent order on its surface. In a seed, these may take the form of seams, the shape of the coat or polarity. In a bud, they may include petal lines, ribs, colour zones and the direction of overlap. In a succulent rosette, they include repeating leaf layers, spiral packing and centred organisation. Analysing such features makes it possible to reconstruct the future form before its complete unfolding.

The bud is also an example of temporary equilibrium. It must not open prematurely, but neither must it remain closed permanently. It is governed by the logic of a threshold. As long as the internal structures are not ready, closure is necessary. Once the conditions of maturation have been attained, closure becomes an obstacle and must be overcome. The bud begins to open when internal growth, tissue development and external conditions produce a transition from containment to unfolding. This corresponds to the transition from Stage A to Stage B.

In this sense, the bud is a form of waiting. This waiting, however, is not passive. Processes continue within it: growth, differentiation, preparation of the petals, formation of the centre, accumulation of colour, tissue development and preparation for its future function. The bud is externally closed but internally active. It is one of the best examples of how a closed Matrix is not equivalent to immobility. It may be dynamic even though its movement remains concealed from external view.

The bud also demonstrates that protection and unfolding are not opposites, but successive phases. Without protection, the future form might be damaged before reaching maturity. Without unfolding, protection would lose its purpose. The sepals, outer petals or covering structures initially contain and preserve the form, and subsequently either separate or become part of the periphery of the open flower. In this process, the shell becomes an edge and the closed boundary an open form. This directly continues the logic described in the chapters on the circle-seed and leaf-like unfolding.

An important feature of the bud is its capacity to preserve an internal hierarchy. It possesses external and internal layers, centre and periphery, base and apex, a concealed axis and future radiality. Even if these elements are not yet equally visible, they are already interrelated. The bud is therefore not simply a mass of petals, but an organised system. Its closure is structured. It is precisely this structured closure that makes it a model of the Matrix.

The bud also makes it possible to understand how a form can be simultaneously whole and incomplete. A closed bud is already an integral structure. It possesses a form, boundary, position on the plant and internal organisation. Yet it is not yet an open flower. Its wholeness is intermediate. It is complete as a bud, but incomplete as a flower. This distinction is important to the entire A–B–C–D model: each stage may be relatively whole in itself while remaining transitional in relation to the broader process.

The bud should therefore not be described as an ‘incomplete flower’ in the sense of deficiency. It is a fully developed stage of floral morphogenesis. Its function is not the same as that of the open flower. It must contain, protect, prepare and compress the future form. The open flower must

manifest, interact, attract and participate in reproduction. Bud and flower are different phases of the same form, and each possesses its own morphological function.

From the perspective of the Matrix hypothesis, the bud is particularly important because it demonstrates the principle of folded radiality. The radial structure of the flower has not yet unfolded within it, but it is already organised. This can be seen in rosette-forming and spiral plant forms, where elements overlap sequentially around a centre. Succulents are particularly expressive in this respect: their leaves form densely packed, geometrically organised rows that simultaneously resemble a bud, a rosette, a spiral and a multilayered Matrix (Fig. 2). Such forms help to demonstrate that biological morphology frequently combines the circle, axis, layer, spiral and edge.

The succulent rosette is also important as an example of a form of unfolding maintained over a long period. Unlike a flower bud, which must pass into flowering, a rosette may retain a centred, layered structure as the stable form of the plant. In it, unfolding and closure seem to coexist. The centre remains dense, the periphery opens, new elements appear internally, and older ones move outwards. This makes the succulent a particularly useful visual model of cyclical morphogenesis: the internally new continuously becomes the externally old.

This movement from centre to periphery is also important for understanding the bud. In an opening flower, the internal elements gradually become externally visible. The periphery expands, the centre opens, and the layers separate. What was inside passes outwards. This is not merely a change of position, but a change of function. A concealed petal becomes a visible petal; a protective layer becomes part of the flower's beauty and structure; and a closed shell becomes an open periphery. The bud displays this transition in concentrated form.

The bud as a closed Matrix also demonstrates the relationship between form and time. Within it, the future is held in the present. The open flower does not yet exist as an external form, but its possibility is already real within the bud. The bud is therefore a temporally compressed form. It contains not only the space of the future flower, but also its time. The opening of the bud releases not only a surface, but also a sequence: the layers open, the petals separate, the centre becomes visible, the flower reaches maturity and then passes into the next stage.

This temporal compression is of great importance to the hypothesis as a whole. The Matrix is not only a spatial schema. It is also a schema of the time of form. The bud demonstrates that time may be folded into a structure. We see a closed body, but within it a future process is already present. In this sense, the bud is the morphological memory of the future: it contains what has not yet occurred but has already been prepared.

The expression 'memory of the future' should, of course, be understood philosophically rather than literally. The bud does not remember the future. It contains the material, biological and morphogenetic conditions of its future unfolding. From the perspective of form, however, it genuinely retains the future structure prior to its manifestation. This makes it possible to describe the bud as a temporal capsule of morphogenesis. It contains a sequence that will subsequently become visible.

The bud is also associated with the concept of measure. It cannot unfold arbitrarily. Its petals possess a particular number, position, form, colour, texture and pattern of overlap. Its unfolding has species-specific and individual limits. The bud therefore contains not infinite possibility, but an organised range of possibilities. This accords with the general understanding of the Matrix: it

does not dictate every detail, but establishes a field of permissible development. Variations are possible within that field.

Different buds of the same species may open in slightly different ways. Some will be more symmetrical and others slightly deformed; some will open completely and others only partially; some will be affected by environmental conditions and others by damage or a lack of resources. The general principle, however, is preserved. This demonstrates the relationship between invariant and variation. The bud carries the typical structure of the flower, but its actual unfolding always occurs within a particular situation.

Even before opening, the bud is also a site of interaction between the internal and external. Light, temperature, moisture, seasonal rhythms, the condition of the plant, nutrition, damage and external mechanical effects may all influence its development. Although it is closed, it is not isolated. Its closure is relative. It protects the internal structure while remaining in a living relationship with the organism and environment. The closed Matrix is therefore always potentially open to the world: it has not yet unfolded as form, but is already embedded within a system of conditions.

This proposition helps to avoid the mistaken conception of the closed Matrix as an entirely autonomous structure. The bud does not develop by itself. It is incorporated into the plant and depends upon its roots, stem, leaves, metabolism and external environment. Its future form is determined not only by internal order, but also by the conditions of growth. The bud therefore demonstrates an important principle: a closed form preserves potential, but realises it only through interaction with a wider system.

In this sense, the bud is a local Matrix within the larger Matrix of the plant. It possesses its own boundary, centre, layers and future cycle, but is not separated from the whole. It depends upon the stem, leaves, root, vascular system and rhythm of growth. This nesting of the local within the whole is one of the key features of biological morphogenesis. This principle will subsequently be important to understanding the flower as a local model of the Universe: a local form reflects general principles, but exists within a larger system.

The bud also helps to clarify the relationship between part and whole. It is part of the plant, yet it contains an entire flower. The flower, in turn, may become part of the fruit and seed cycle. The seed that subsequently develops will become the beginning of a new plant. The part thus continuously passes into the whole, while the whole generates new parts. The bud occupies a central place within this logic. It is small, but contains a future complex form. It is local, but connected with the plant’s overall life cycle.

Several features are important in the morphological analysis of a bud. The first is the degree of closure. How tightly do the petals and covering elements contain the internal structure? The second is the presence of visible lines of overlap, grooves, seams or ribs. These may indicate future petals and layers. The third is the shape of the overall shell: rounded, oval, conical, teardrop-shaped or rosette-like. The fourth is the prominence of the axis: base, apex and direction of growth. The fifth is the presence of indications of future radial or spiral organisation. The sixth is the state of the edge: concealed, partly exposed or beginning to separate. These parameters make it possible to describe the bud as Stage A analytically rather than impressionistically.

Three types of illustration are especially important for the section on the bud.

The first is a closed bud in which the future floral form is almost entirely concealed and only the external shell is visible (Fig. 1).

The second is a succulent or rosette-forming structure in which the centre, layers and spiral-radial arrangement of the elements demonstrate the principle of densely packed form (Fig. 2).

The third is a partially closed floral structure in which the lines of the petals are already visible but complete unfolding has not yet occurred (Fig. 3).

These three images will present Stage A not as an abstract schema, but as actual biological morphology.

The bud as a closed Matrix also has aesthetic significance. Its beauty differs from that of the open flower. The flower impresses through openness, colour, radiality, petals and periphery. The bud impresses through concentration, tension, the promise of form and the latent energy of unfolding. Its beauty lies not in completion, but in anticipation. In this sense, the bud aesthetically expresses the stage of potentiality. It presents form prior to manifestation, but already conveys a sense of its future fullness.

This aesthetic perception may be important to the philosophical level of the hypothesis. Human beings often perceive the bud as a symbol of beginning, youth, concealed beauty, future unfolding and protected life. The book must not, however, stop at symbolism. The bud's symbolic meaning is grounded in its morphology. It genuinely contains its future form in compressed state. Its cultural expressiveness is connected with its natural structure. It may therefore serve as a bridge between the biological and philosophical levels of analysis.

The flower should not, however, be declared a metaphor for the Universe in a literal sense. Such a claim would be too strong and methodologically vulnerable. It is more accurate to say that the flower is a local model of the unfolding of form. It is useful for analysis because, on a small scale, it displays the general elements of morphogenesis: a closed state, axis, radiality, layering, edge, unfolding and reproduction. The bud as a closed Matrix is the first stage of this local model.

The bud also reveals why the biological level of the Matrix occupies a special place in this book. In biology, morphogenesis is not merely an external analogy; it is an actual process through which form develops. Here it is possible to speak of growth, tissues, cellular differentiation, the mechanics of unfolding, water exchange, regulation, function and reproduction. Biological material therefore offers a higher level of evidential support for arguments concerning morphogenesis than cultural symbols or visual analogies with cosmic structures. Applied analysis of the Matrix should therefore naturally begin with biology.

Even in biology, however, precision must be maintained. The bud is not the 'Matrix of the Universe' in a literal sense. It is a local biological model in which the logic of the Matrix as a morphogenetic process can be clearly observed. Its significance lies not in explaining the entire Universe, but in demonstrating relations of universal importance: the latent and the manifest, centre and periphery, layer and petal, fold and unfolding, protection and openness, completion and the new cycle.

Within the hypothesis of the Unified Matrix of the Universe, the bud thus functions as the closed Matrix of floral form. It contains the future flower in a compressed, protected and internally organised state. Concealed within it are the centre, axis, radiality, petal layers, future edges and potential for unfolding. It constitutes a local Stage A within the plant's broader biological cycle. Its closure does not signify emptiness; it signifies the preservation of the future form until the moment of threshold unfolding.

The bud is therefore one of the most precise biological images of the closed Matrix. It demonstrates how a complex form may be folded, protected, prepared and contained within a compact structure. When this structure opens, it is not created from nothing, but manifests what has already been organised. The analysis of the bud thus prepares the next stage of the chapter: an examination of the flower's centre, axis and radiality—in other words, of how the closed Matrix begins to unfold around an internal centre.

9.2. Centre, Axis and Radiality

Having considered the bud as a closed Matrix, it is necessary to turn to the moment when the flower's internal structure begins to become visible. The principal elements of this transition are the centre, axis and radiality. In the open flower, they form a single morphological system: the centre holds the composition together, the axis establishes the direction of development, and radiality distributes the form around the central region. This is why the flower is one of the most expressive local models of morphogenesis.

Outwardly, an open flower is often perceived primarily as a radial form. The observer sees a centre from which petals, rows, lines, colour zones and edges extend. The flower appears to be a form unfolding in every direction. This radiality, however, does not arise suddenly. It is prepared by the preceding axial organisation of the bud. Before opening, the flower exists as a vertically oriented closed structure: it possesses a base, apex, direction of growth, connection with the stem and concealed internal axis. When the bud opens, this axis does not disappear; it is transformed into a centred radial composition.

This transformation is particularly important to the hypothesis of the Unified Matrix of the Universe. The flower demonstrates that the axis and radiality are not opposites. The axis establishes the initial direction, while radiality constitutes one form of its unfolding. In the bud, the axis is expressed as vertical compactness. In the open flower, it becomes less apparent because attention shifts to the centre and periphery. Morphologically, however, the axis retains its significance: it connects the flower with the stem, determines the position of the centre, establishes the direction of growth and maintains the relationship between the unfolded form and the plant as a whole.

The centre of the flower is not merely its geometrical midpoint. It is a morphological node around which the entire floral structure is organised. The reproductive elements, focal points of visual attention, accents of colour and texture, and the origin of the petal arrangement are concentrated in the centre. In different flowers, the centre may be large or small, open or partly concealed, simple or complex, smooth or granular, monochromatic or contrasting. In every case, however, it performs an organising function: the entire form is read from it or around it.

The centre of the flower may be considered the manifested continuation of the concealed centre of the bud. In the closed state, the centre was protected and surrounded by layers of petals and covering structures. It existed as an internal point of organisation but was inaccessible to external perception. As the flower opens, the petals separate and the centre becomes visible. This is a highly significant morphogenetic moment: the concealed centre becomes an open centre. What was internal becomes the compositional and functional focus of the unfolded form.

The flower's radiality arises through the relationship between centre and periphery. Petals, stamens, sepals, colour zones and lines of growth are frequently arranged around the central region. This arrangement may be strictly radial, approximately radial, spiral, bilaterally symmetrical or complex; yet even in asymmetrical floral forms, the relationship between the internal region and the unfolding periphery remains. The flower demonstrates how a centred structure may become a peripheral form composed of multiple elements.

In the open flower, radiality makes visible what had been concealed within the bud as layered packing. Petals that previously overlapped one another separate around the centre. Their edges become visible. Their surfaces begin to interact with light, air, moisture, pollinators and the observer's gaze. Radiality is therefore not only a geometrical arrangement of elements, but also a means through which the flower's internal architecture unfolds into external space.

It is particularly important that radiality is not always perfect. Real flowers may exhibit different degrees of symmetry. Some display an almost regular radial arrangement of petals; others possess pronounced bilateral symmetry; and still others exhibit complex asymmetry associated with the form of the corolla, pollination, the position of the flower and evolutionary specialisation. Even in such cases, however, the centre, axis and periphery remain key points of reference for analysis. The Matrix is manifested not only through perfect circular symmetry, but also through organised deviation from it.

The flower's radiality may be understood as unfolded symmetry. At the bud stage, the symmetry was concealed, compressed and closed. In the open flower, it becomes visible. Visible radiality, however, is no longer equivalent to the original closure. The circle of the bud was compact and protected; the radiality of the flower is open and peripheral. In other words, the flower does not merely repeat the circle. It transforms circular wholeness into an open system of rays, petals, layers and edges. This is a transition from closed symmetry to open symmetry.

This transition is of considerable importance to the A–B–C–D model. Stage A corresponds to the closed bud. Stage B corresponds to the beginning of unfolding, when the petals begin to separate. Stage C corresponds to the formation of a multilayered structure, when the rows of petals, folds, edges and lines become manifest. Stage D corresponds to the complete opening of the flower, when the centre and radiality attain maximum visibility. Throughout this process, the centre, axis and radiality pass through different states: latent, transitional, increasingly complex and fully manifested.

It is particularly important to consider the flower's axis not merely as a visible line, but as a principle of organisation. In the open flower, the vertical axis may not be immediately apparent because the petals spread outwards. It nevertheless persists through the flower's connection with the stem, the position of the receptacle, the direction of growth, and the relationship between the lower and upper parts of the floral structure. If the stem, base of the flower, centre and apex of the unfolding are mentally connected, it becomes clear that the radial form is supported by a concealed axis. The flower unfolds not in empty space, but upon an axial foundation.

In this sense, the flower may be considered a form in which an axis passes into a plane or cup. The bud was predominantly a vertical closed form. The open flower may become planar, cup-shaped, star-shaped, funnel-shaped, bell-shaped or rosette-like. In every case, however, the unfolding proceeds from an axial foundation. The axis becomes the centre of the unfolded surface. This transformation of the axis into centred radiality is one of the most important biological examples of morphogenesis.

The centre of the flower is also a site of transition from structure to function. It not only organises the composition, but also participates in the plant's reproductive function. The centre must therefore not be understood only aesthetically. Its colour, form, texture, relief, arrangement of stamens and pistils, and relationship with the petals and pollinators all possess biological significance. The flower does not unfold for the sake of abstract beauty, but in order to participate in the life cycle. The beauty of the flower is the visible aspect of a complex functional organisation.

This proposition is of fundamental importance to the Matrix hypothesis. The morphological analysis of a flower must not be reduced to visual symmetry. The centre, axis and radiality possess biological meaning. They are connected with growth, development, pollination, protection of the reproductive organs, attraction of living organisms, distribution of tissue and the transition to fruiting. The flower is therefore a powerful model of the Matrix precisely because form, function and process are closely interconnected within it.

The centre of the flower often functions as the region in which the meaning of the form is most highly concentrated. The entire visible organisation is constructed around it. The petals direct the observer's gaze and the movement of pollinators towards it. Colour contrasts may enhance its visibility. Radial lines, spots, veins and textures may act as guides. In this respect, the flower demonstrates that radiality may be not only structural, but also functionally navigational. The form directs movement and attention towards the centre.

The veins and growth lines of the petals also frequently follow a centred logic. They may extend from the base of the petal towards its edge, forming a delicate network of directions. These lines connect the internal region of the flower with the periphery of the petal. They demonstrate that the flower's radiality continues within each individual element. The petal itself may possess a small axis, subsidiary lines, its own edge and internal architecture. The flower thus displays the nested character of morphological principles: the centre of the flower, the axis of the petal, the petal edge, its veins and the microrelief of its surface.

This nesting is particularly important to a fractal understanding of the biological level of the Matrix. The flower as a whole possesses a centre and periphery. Each petal possesses a base, axis, growth lines and edge. Within the petal, there may be veins, fibres, colour gradients and microstructures. The principle of centred unfolding is therefore repeated at several levels, although not as an exact mathematical copy. The flower is not a strict fractal, but a natural multilevel structure in which general relationships recur with variations.

The flower's radiality is also associated with number. Many flowers display a particular number of petals, sepals, stamens or other repeating elements. This number may be a characteristic of the species, connected with botanical organisation and the hereditary programme of development. In the context of the Matrix, number is important not as a mystical quantity, but as an indicator of the regularity of morphogenesis. The flower does not unfold as an arbitrary collection of elements, but as a particular repeating structure. The number, order and arrangement of the elements create a morphological rhythm.

Rhythm is manifested within the flower through the repetition of petals, alternation of layers, direction of veins, form of the edge, colour zones, symmetry and asymmetry. This rhythm makes the flower a legible form. The observer perceives not separate petals, but a coordinated whole. In this sense, radiality is rhythm around a centre. It transforms a multiplicity of elements into a composition. This is important to the Matrix hypothesis: form becomes manifest not merely when its elements exist, but when they are organised into a rhythmic whole.

The flower also demonstrates that a centre may be not a single point, but a complex region. In some flowers, the central region consists of numerous small elements forming a granular, spiral, disc-shaped or dome-like structure. In such cases, the centre itself becomes multilayered and multicomponent. It is not simply the origin of radiality, but a local world of form. This is particularly evident in complex flower heads, where what appears to be a single flower may include numerous small flowers or floral elements. Here centre and multiplicity are especially deeply intertwined.

Such a complex centre demonstrates that the Matrix is not always constructed according to a simple schema of 'one point—many petals'. The centre may itself contain an internal multiplicity. Radiality then unfolds not from an absolutely simple point, but from a structural node. This is important to a more developed understanding of the model: the centre may be complex, the axis may be concealed, radiality may be multilevel, and the periphery may contain new centres. The flower makes this complexity visible without leaving the domain of biological material.

The flower's axis and radiality are also connected with spirality. In certain floral and rosette structures, elements are arranged not only radially, but also along spiral trajectories. This is especially apparent in rosettes, succulents, certain inflorescences and the arrangement of seeds and petals. Spirality demonstrates that unfolding around a centre may be dynamic rather than merely radial. The form does not simply extend from the centre; it may unfold through rotation, creating an impression of growth, movement and sequence.

In this respect, the spiral complements radiality. Radiality represents simultaneous unfolding around a centre. The spiral represents sequential unfolding around a centre. A flower or rosette-like plant form may combine both principles: elements spread towards the periphery while simultaneously being organised according to a spiral logic. This is important to the Matrix because the development of form often connects space and time. Radiality expresses spatial distribution; spirality expresses the temporal sequence of growth.

When analysing images of flowers, these two types of organisation must be distinguished. One flower may be predominantly radial, another spiral-radial, a third bilaterally symmetrical and a fourth complex and asymmetrical. All may be included within the biological level of the Matrix, but with different emphases. Flowers must not all be reduced to a single ideal schema. It is more accurate to speak of a spectrum of centred forms: from strict radiality to complex organised asymmetry.

Radiality may also be concealed or partial. In some flowers, the petals are arranged in such a way that the general centre is preserved, but the external form possesses a strong bilateral orientation. Such flowers are particularly important because they demonstrate the transition from radiality to specialised asymmetry. The morphogenetic centre remains, but unfolding is subordinated to a particular functional task, such as interaction with specific pollinators. In such cases, the Matrix is manifested not as ideal symmetry, but as an adapted structure.

This demonstrates that the centre and axis may carry different degrees of significance in different floral forms. In some flowers, the centre and radiality dominate. In others, the axis and bilateral symmetry predominate. In others still, spiral arrangement is more prominent. A fourth group may exhibit a complex combination of all these principles. Analysis of the flower as a local model of the Matrix must therefore be typological. It must take into account which particular organisation predominates: radial, axial, spiral, layered, cup-shaped, tubular, star-shaped, rosette-like or asymmetrical.

In all these variants, however, the centre remains a key concept. Even when a flower does not appear perfectly radial, it possesses an organisational region from which the form is constructed. Even if the axis is visually concealed, it is present through growth and connection with the stem. Even if radiality is disrupted, the relationship between internal and external remains. The centre, axis and radiality therefore constitute not a rigid geometrical schema, but a system of morphological relations.

The centre of the flower may also be considered a point of maximum integration. Processes of growth, reproductive function, colour organisation, symmetry, interaction with pollinators and the transition to fruit converge within it. The petals, lines, scent, colour and form all operate around this centre. The centre is therefore not only a beginning, but also a place where different levels are united. Biological function and morphological composition coincide there with particular intensity.

The axis, by contrast, connects the flower with the larger organism. It reminds us that the flower is not autonomous. It does not hang in space as an independent symbol. It forms part of the plant and is connected with the stem, leaves, root, vascular system, and the cycles of nourishment and reproduction. If the centre organises the flower internally, the axis connects it with the plant as a whole. Centre and axis therefore perform different but complementary functions: the centre assembles the floral form, while the axis incorporates it into the organism.

Radiality, in turn, connects the centre and periphery. It opens the internal towards the external. The petals extend from the internal region towards the edge, creating a visible structure of interaction with the outside world. In this sense, radiality is a form of communication. The flower opens in order to be perceived, to interact and to participate in reproduction. Radiality is not merely beautiful; it opens the flower to the world.

This approach avoids the superficial metaphor of the ‘flower as the Universe’. The flower is not the Universe in miniature and does not provide evidence for the structure of the cosmos. It is, however, a local model of the unfolding of form, in which relationships important to a broader morphology are clearly visible within a small biological object: centre, axis, periphery, radiality, layers, edge, rhythm, function, unfolding and cycle. The flower may therefore be used as a key to reading morphogenesis, but not as a direct representation of the Universe.

Images of open flowers in which the centre and radial arrangement of the petals are clearly visible are particularly useful for the illustrative sequence accompanying this section (Fig. 4). Such images demonstrate how the closed structure of the bud passes into an open centred form. Images of flowers or succulent rosettes with a pronounced spiral arrangement of elements are also important (Fig. 5). They demonstrate that radiality may be combined with sequential spiral unfolding. Finally, images of a flower viewed from the side or in partial section, revealing the connection between the centre, base and concealed axis of growth, would also be useful (Fig. 6).

When using these illustrations, it must be explained that an image of an open flower is not evidence of a universal law, but a biological example of centred morphogenesis. Its value lies in its clarity. A single object shows how a closed form opens around a centre, how an axis becomes a radial composition, how petals extend towards the periphery, how the edge becomes active, and how the internal structure emerges outwards.

The flower also makes it possible to demonstrate the distinction between a centre and a geometrical midpoint. In some flowers, the visible centre may be displaced, elongated, complex or functionally divided. This does not negate centred organisation if the structure is nevertheless

arranged around a particular region. In the Matrix, therefore, the centre is not always a mathematical point. It is the region of maximum organisation from which the form may be read. This approach makes the analysis more flexible and closer to the realities of nature.

The centre may be open or closed. In some flowers, it is clearly visible and contrasts with the petals. In others, it is concealed deep within the corolla. In still others, it is partly covered by the petal structure. This demonstrates different degrees of unfolding. A completely open centre corresponds to a high degree of manifestation. A partly concealed centre retains a connection with the logic of the bud. Tubular or bell-shaped forms may contain the centre within the flower's depth, demonstrating that unfolding may proceed not only into a plane, but also into a volume.

Three-dimensional flowers are especially important to a more precise understanding of radiality. Radiality does not necessarily imply a flat form. A flower may unfold as a cup, funnel, tube, bell, sphere or multilayered structure. In such cases, the centre and axis are related to depth. The petals do not simply lie in a plane, but create space. This demonstrates that radiality may be three-dimensional. The flower unfolds not only across a surface, but also within a volume.

This three-dimensional understanding is important to the Matrix. If radiality is considered only as a flat pattern, the living form of the flower will be lost. In reality, the flower possesses depth, petal thickness, curves, folds, tubular structures, cup-shaped depressions and internal cavities. The centre is not located merely within an image, but within the living space of the flower. The axis passes through that space and connects it with the plant. Radiality unfolds within a three-dimensional environment.

Petal folds also participate in the organisation of radiality. Petals may be curved, undulating, twisted, folded, recurved or folded inwards. These folds make the radial structure living and variable. They demonstrate that the flower does not unfold as a flat schema, but as a surface carrying the memory of the bud, the stresses of growth and interaction with the environment. The centre and radiality must therefore be analysed together with the fold and edge.

The petal edge completes the radial structure. If the centre is the internal focus, the edge is the outer limit of unfolding. The entire morphology of the flower unfolds between centre and edge. The petals form pathways from the internal to the external. Their veins, colour lines, folds and texture often direct the gaze from edge to centre or from centre to edge. The flower may therefore be read as a system of radial transitions: centre—petal—edge—external environment.

This system clearly demonstrates the general principle of the Matrix: a concealed centre unfolds through layers and reaches an active periphery. In the bud, the centre was concealed, the petals were layers and the edge was folded inwards. In the open flower, the centre is exposed, the petals have become independent elements and the edge has entered external space. What was internal has become external; what was a layer has become a petal; what was a shell has become a periphery. The flower provides a clear example of this transition.

The flower's radiality is also connected with the cycle. Complete opening is not the end. The exposed centre participates in a subsequent process leading to the fruit and seed. The centre of the flower is therefore not only the focus of unfolding, but also a gateway to the next cycle. One phase concludes within it and another begins. The petals expose the centre, but the centre's biological meaning is associated with reproduction. In this respect, the flower connects Stage D with a future new A.

The centre of the flower thus has a dual temporal orientation. It is both the outcome of the bud's unfolding and the beginning of the future fruit-and-seed cycle. Past and future meet within it. The

past is the closed bud, layers, folds and growth. The future is the fruit, seed and new cycle. The centre of the flower must therefore not be understood merely as a spatial midpoint. It is a temporal node of morphogenesis. Unfolding concludes within it, and a new folding is prepared.

The axis also possesses temporal significance. It connects the flower with the plant's preceding growth and with the subsequent development of the fruit. The flower is located on the axis of a stem, shoot or pedicel. After flowering, this same region may become the site of fruit formation. The axis is therefore not only a geometrical direction, but also a line of continuity. Through it, the flower is incorporated into the biological cycle. Radiality unfolds the form outwards, while the axis holds it within the line of the plant's life.

In this sense, the flower is the point at which two directions intersect: the vertical and the radial. The vertical direction connects it with the growth of the plant, the stem, root, future fruit and seed. The radial direction opens it towards external space, light, air, pollinators and perception. The flower arises where the vertical axis of life passes into the horizontal or cup-shaped unfolding of form. This intersection makes it an especially powerful model of the Matrix.

Philosophically, the flower's centre, axis and radiality may be said to express the transition from internal necessity to external manifestation. The axis carries the internal directionality of development. The centre concentrates function and structure. Radiality unfolds this structure outwards. The flower becomes a visible world of small-scale form. This 'world', however, must not be understood mystically. It is a local biological system in which morphogenesis attains a high degree of visibility.

The flower may therefore be called a local model of the Universe only in a strictly limited sense. It is not a model of all the physical processes of the Universe. It does not directly explain galaxies, nebulae, geology or culture. It does, however, display on a small scale a general morphogenetic situation: what is latent unfolds around a centre; the axis is transformed into radiality; layers become elements; the edge becomes active; the form reaches manifestation and passes into a new cycle. In this sense, the flower is a local model not of the Universe as a physical system, but of the universal process of form generation.

The unfolding of the flower is thus organised around a centre and concealed axis. The centre organises the visible form, the axis connects it with the plant's growth and the internal history of the bud, and radiality unfolds the internal order towards the periphery. In the fully open flower, the axis may visually dissolve within the radial composition, but morphologically it remains the foundation of the unfolding. The flower is therefore not merely a beautiful symmetrical form, but a living structure in which centre, axis and radiality are united within the process of morphogenesis.

This analysis prepares the following section, devoted to the petal. Whereas the centre and radiality explain the flower's overall organisation, the petal reveals how an individual element of the unfolded form arises from a former layer of the bud. The petal will make clear how concealed layering becomes the independent elements of the periphery.

9.3. The Petal as a Former Layer

Having analysed the flower's centre, axis and radiality, it is necessary to turn to an individual element of the unfolded floral form—the petal. At first sight, the petal is perceived as an

independent part of the flower: it possesses its own surface, colour, edge, form, texture, veins and position in relation to the centre. Morphogenetically, however, the petal does not arise as an isolated element. Before the flower opened, it formed part of the bud's closed, layered structure. The petal may therefore be considered a former layer which, in the process of unfolding, separated, opened out and became an independent element of the visible form.

This proposition is important to the hypothesis of the Unified Matrix of the Universe. It demonstrates that the elements of an unfolded form often originate from concealed layers. What at Stage A was a shell, overlap, fold or internal level may become an independent part of the periphery at Stage D. The petal is one of the clearest examples of such a transformation. Within the bud, it does not yet exist for external perception as a free form. It is pressed against other petals, incorporated into the overall shell-like structure, partly concealed and frequently folded or overlapped. As the bud opens, however, it emerges and acquires its own morphological role.

Within the closed bud, the petals are arranged in layers. They may overlap one another, enclose the centre, form a dense spiral or radial packing, and create a protective shell around the internal parts of the flower. In this state, the petal is not so much an independent element of the periphery as a participant in the internal architecture. Its surface may be concealed, its edge directed inwards and its form not yet fully opened. It belongs to the whole as a layer rather than as a separate external figure.

The opening of the flower changes the status of the petal. It ceases to be merely part of a protective or closed structure. Its surface is exposed to light and air, its colour becomes visible, its edge begins to interact with the external environment, and its form participates in the flower's overall radiality. The petal becomes an independent element of the unfolded composition, but retains the memory of its previous state. Its curves, folds, lines of overlap, the form of its base and the direction of its unfolding may indicate that it was once part of a closed layer.

The petal should therefore be understood not as a static detail, but as the result of a transformation. In the A–B–C–D model, the petal passes from the concealed layer of Stage A, through the first separation of Stage B and the further unfolding of Stage C, to the complete manifestation of Stage D. At Stage A, it is contained within the bud. At Stage B, it begins to separate from the neighbouring layers. At Stage C, its surface, edge, veins, folds and colour unfold. At Stage D, it becomes a mature element of the open flower. The petal thus possesses its own small morphogenetic cycle within the cycle of the flower.

The petal as a former layer demonstrates particularly clearly that an unfolded form does not create its elements from nothing. They were prepared earlier, but existed in a different state. This accords with the general logic of the Matrix: the manifest arises from the latent, the independent from the nested, the peripheral from the internal, and the open from the closed. The petal exemplifies how internal layering becomes external multiplicity. The bud contained layers; the flower displays petals.

This transformation may be described as the conversion of a layer into an element. Within the bud, the layer performs the functions of containment, protection, overlap and latent organisation. Within the open flower, the element performs the functions of visible participation in the radial composition, interaction with the environment and attraction. The same morphological structure changes its function according to the stage. Form within the Matrix therefore changes not only its outward appearance, but also the mode of existence of its parts.

The petal also provides an example of how a boundary may become a surface. Within the bud, the edge of the petal is frequently concealed, while the petal itself may function as part of an internal boundary. As it opens, it unfolds into a surface. What was formerly an internal layer becomes an open plane or curved plate. This transformation is highly significant: morphogenesis not only exposes the centre, but also converts concealed boundaries into visible surfaces. The flower becomes complex because its layers do not merely separate; they acquire their own forms.

The surface of the petal is not empty. It possesses texture, colour, veins, fibres, growth lines, and sometimes spots, gradients, microrelief and folds. All these features make the petal an independent carrier of morphogenetic information. It belongs to the flower as a whole, but may itself be read as a small structure. It possesses a base, direction, edge, internal network, surface organisation and connection with the centre. The petal is therefore not only part of the flower, but also a local model of unfolding.

The base of the petal is particularly important. It connects the petal with the centre of the flower and with the formerly internal structure of the bud. The petal generally unfolds from its base towards the periphery. This movement reveals a small-scale version of the general floral process: centre—direction—surface—edge. The petal seems to repeat the flower's morphological logic within a single element. The flower possesses a centre and periphery; the petal possesses a base and edge. The flower possesses radiality; the petal possesses directed unfolding from its base towards its outer limit. This is another example of the nested character of the Matrix.

The petal edge is of particular significance. While the petal was a layer within the bud, Its edge may have been concealed or pressed against neighbouring elements. In the open flower, the edge becomes an active periphery. It may be smooth, undulating, serrated, fringed, curled, torn, folded or even. The petal edge reveals not only the species-specific form, but also the history of unfolding, tissue stresses, degree of maturity, and interaction with air, moisture, light and time. The petal therefore demonstrates especially clearly the transition from a concealed layer to an active edge.

The undulating edge of a petal may be considered a trace of internal growth and unfolding. As the petal's surface increases, its edge may curve and form waves, folds or scallops. These forms demonstrate that unfolding does not always occur uniformly. Different regions of tissue may grow at different rates, experience different stresses and interact differently with the environment. The petal edge is therefore a visible record of uneven development. It demonstrates that the former layer has become a living periphery.

The petal's folds are likewise traces of its previous state. Many petals retain curves, lines, longitudinal or transverse folds, curled edges and concave or convex surfaces. These folds may result from packing within the bud, patterns of growth, tissue mechanics or the functional form of the flower. In every case, they demonstrate that the petal is not an ideally flat component. It carries the memory of foldedness and unfolding. Its surface is a surface with a history.

This historical character of the petal is particularly important. If the petal is considered only as a decorative element, its morphogenetic meaning is lost. The petal is beautiful not in isolation, but because the history of form is visible within it: it was concealed, folded and protected, then opened, became a surface, and acquired an edge, colour, line and function. Its beauty is the beauty of a former layer that has unfolded. In this sense, the petal demonstrates that the aesthetics of the flower is grounded in process.

The petal also carries colour. Within the bud, its colour may be concealed, partly visible or muted by the outer layers. As the flower opens, the coloured surface emerges. Colour becomes part of the flower's interaction with its environment: it may attract pollinators, create a contrast with the centre, direct attention and distinguish the form. Morphologically, colour makes the former layer visible not merely as a surface, but also as a signal. The petal becomes not simply unfolded tissue, but a visually active element.

The colour of a petal may also possess its own internal structure: gradients, spots, stripes, veins, dots, and central or peripheral accents. These colour elements are often related to the direction from base to edge or from edge to centre. They may reinforce the flower's radiality, emphasise the axes of the petals, and create rhythm and contrast. Petal colour therefore enters the morphological language of the Matrix as part of the unfolded surface. It makes visible directions and zones that were concealed within the bud.

The internal lines of the petal—veins, fibres, fine grooves and coloured stripes—demonstrate that the petal is not a homogeneous plate. It possesses an internal distribution. Lines of growth and nourishment, tissue microstructures and, in some cases, visible vascular or pigment pathways extend from the base towards the edge. These lines connect the petal with the general principle of leaf-like unfolding. In this sense, the petal is related to the leaf: it possesses a surface, internal directions, an edge and a connection with the flower's central structure.

The petal must not, however, be entirely identified with the leaf. Leaves and petals possess different functions and biological roles. The leaf is primarily associated with photosynthesis and exchange, whereas the petal is associated with floral structure and the plant's reproductive strategy. Morphologically, however, they may be compared as unfolded plant surfaces possessing a base, direction, tissue, lines, edge and interaction with the environment. Within the Matrix, this comparison is useful provided that their functional differences are preserved.

The petal as a former layer also helps to explain why the flower is perceived as a multilayered form. In the open state, petals may be arranged in a single row or several rows; they may alternate, overlap or form a cup, star, rosette, funnel or complex double-flowered structure. In double and many-petalled flowers, it is particularly evident that the flower's unfolded beauty is associated with multiple layers that have separated and become visible. The greater the number of such layers, the stronger the impression of depth and volume.

A many-petalled structure demonstrates that the former layer need not disappear as an organisational principle after unfolding. The petals become independent elements but continue to form layers. They are no longer packed as tightly as they were within the bud, but retain an order of overlap. The flower becomes an open layered system. The petal is therefore simultaneously a former layer and part of a new layering. Its status has changed, but it has not entirely lost its connection with the principle of the layer.

This is especially evident in roses, peonies, dahlias, chrysanthemums and other flowers with complex petal structures. Their open forms contain numerous rows, each of which gradually reveals a path from the periphery to the centre or from the centre to the outer layers. In such flowers, the observer sees not a single plane, but an architecture of unfolding in depth. The flower becomes a space in which the petals operate like the open pages of a formerly closed structure. Each petal is a layer that has become visible.

This principle is also preserved in simple flowers with a small number of petals, although it is expressed differently. There, each petal appears more clearly as a separate radial element. The

layering may be less pronounced, but the relationship between base, surface and edge is more readily visible. Such flowers are useful for analysing the petal's axis and radial distribution. Complex flowers are useful for analysing multilayeredness and the transition from bud to complete unfolding. Both types are important to this chapter because they display different variants of a single morphogenetic principle.

The petal may also be considered a facet of the flower. If the flower as a whole is an open, multiradial structure, the individual petal is one of its facets—one visible region of the whole. It has its own orientation but remains connected with the centre and neighbouring petals. It may partly overlap another petal or be overlapped by it. It may be rotated, curved, inclined or twisted. The petal structure of the flower is therefore not only a series of layers, but also a system of facets. Each petal constitutes one face of the unfolded floral Matrix.

This concept is particularly useful when analysing the flower in three dimensions. A flat image often simplifies the flower by turning it into a pattern. A real flower, however, possesses spatial depth. Its petals are arranged at different angles and create shadows, overlaps, internal cavities, cup-like forms, projections and depressions. When petals are considered as facets, it becomes clear that the flower is not a flat ornament, but a three-dimensional system of surfaces. The petal as a former layer becomes a facet of unfolded space.

The petal also demonstrates the relationship between form and function. It participates In attracting pollinators, protecting internal organs during the early stages, forming the corolla, and creating the flower's colour and spatial structure. Its form may be broad, narrow, tubular, ligulate, rounded, elongated, dissected, undulating or curled. These differences are not random. They are connected with species-specific organisation, environmental conditions, pollination strategy, the mechanics of unfolding and evolutionary history. The petal must therefore not be understood merely as a decorative layer. It is a functional surface.

This is important to the Matrix hypothesis because morphogenetic form is always connected with the requirements of the system. The petal does not unfold merely for the sake of symmetry. Its unfolding forms part of the biological process of flowering. The colour, form, edge, scent, position and texture of the petals all participate in the plant's interaction with the external world. The former layer therefore becomes not only a visible element, but an active participant in the life cycle.

The petal also demonstrates that the periphery may possess its own directionality. In an open flower, the petals extend from the centre, but each has its own subsidiary axis. This axis may run from the base to the tip, or from the internal region to the outer edge. Veins, coloured lines, folds and the form of the edge frequently emphasise this direction. The flower consequently possesses not a single axis, but a system of subsidiary axes extending from the centre. The petals carry these smaller directions.

This distribution of subsidiary axes makes the flower a radially polycentric form. The centre remains dominant, but each petal acquires its own internal organisation. This corresponds to Stages C and D of the A–B–C–D model: the originating centre produces numerous local elements that retain their connection with the whole but possess structures of their own. The petal as a former layer becomes a local unit of the Matrix. It is simultaneously subordinate to the centre and endowed with its own morphology.

In this respect, the petal is associated with the principle of modularity. Within a flower, the petal frequently functions as a repeating module. Several petals form the corolla. Each module

resembles its neighbour, but need not be completely identical to it. Petals may differ in size, curvature, position, colour and degree of unfolding. Such variable modularity is one of the most important features of natural form. The flower is constructed from repeating elements but does not become a mechanical copy. It retains its living individuality.

The modularity of petals is especially important to understanding radiality. The flower's radiality is created not by an abstract circumference, but by the repetition of petal modules around a centre. Each petal is a ray, facet, former layer and independent surface. Together, they create an integral form. The flower's radiality is therefore not merely a geometrical property, but the result of the organised repetition of petals. The petal is the building unit of floral radiality.

This modularity remains concealed within the bud. The petals have not yet become visually distinct, or are only partly distinguishable. Their modularity is folded within layered packing. As the flower opens, the modules become discernible. This transformation of latent modularity into manifest modularity is another important aspect of morphogenesis. The form first contains repeating elements within a closed whole and subsequently unfolds them as a visible system. The petal is the element through which this concealed repetition becomes apparent.

The petal is also associated with individual deviation. Even within a single flower, the petals may not be identical. One may be more strongly curved, another broader, a third slightly damaged and a fourth more fully unfolded. These differences do not destroy the whole. On the contrary, they create living asymmetry. The flower remains a recognisable radial or centred form, but its particular unfolding is individual. The petal is where the universal module receives a particular realisation.

This particular realisation may be shaped by internal and external factors. Internal factors include genetics, tissue growth, the petal's position within the bud, nutrition and the development of the flower. External factors include temperature, moisture, light, wind, damage, insects and the timing of unfolding. The petal therefore records not only the flower's general plan, but also the particular history of its unfolding. Like the edge of a leaf, the petal is a biographical surface of form.

An important aspect is the transition from internal colour to external colour. Within the bud, some petals may be concealed and not yet perform their full visual function. After unfolding, their colour becomes an external signal. The former layer thus becomes a carrier of information for the environment. In this sense, the petal translates internal structure into external communication. It makes the flower visible, noticeable, distinguishable and integrated into the ecological system.

The petal also participates in creating the internal space of the flower. In some flowers, petals form a cup; in others, a tube; in others still, an open plane or complex multilayered cavity. The petal is therefore not merely located on the periphery, but also forms the flower's internal space. When the former layers of the bud unfold, they create a volume accessible to light, air, insects and the gaze. This is another example of a concealed structure becoming an open environment.

Flowers in which the petals retain partial closure—bell-shaped, tubular and funnel-shaped forms—are particularly expressive. In such flowers, the petals have already opened, but have not separated completely into a plane. They form an intermediate structure between the bud and the open flower. Such forms demonstrate that unfolding may possess different degrees. The petal may remain part of a shell while simultaneously becoming a visible element. This is particularly important to an understanding of the continuity of the A–B–C–D stages: transitional states exist between them.

In a bell-shaped flower, the petals may be fused or may form a common corolla. Here the petal as a distinct former layer may be less apparent because the elements remain connected. The morphological principle nevertheless remains: the closed or partially closed floral structure opens its internal surface outwards. The petal regions may form lobes, edges, waves and folds. This demonstrates that a layer need not become completely separate, but may remain connected with other layers. The Matrix permits different degrees of independence among its elements.

This case is particularly important in refining the model. A former layer does not always become a completely separate petal. It may remain part of a common tube, cup or complex shell. The section should therefore not claim that every petal necessarily separates as an independent plate. The more precise proposition is that a petal, or petal region, may be regarded as an unfolded former layer of the floral structure. Its degree of independence depends upon the type and morphology of the flower.

The petal also helps to clarify the relationship between biology and geometry. Its form may be rounded, oval, lanceolate, heart-shaped, elongated, fan-shaped, dissected, undulating or asymmetrical. Behind this geometry, however, lie processes of growth and function. At the biological level of the Matrix, geometry is not an independent abstraction. It is the result of living morphogenesis. The petal demonstrates that form arises from tissue, growth, stress, folding, unfolding and interaction with the environment.

Images of buds in the phase of partial opening, where individual petals can be seen emerging from the common layered shell, would be especially useful for the illustrative sequence accompanying this section (Fig. 7). Images of double flowers, in which numerous petals retain an evident relationship with the principle of the layer, are also important (Fig. 8). A third group should consist of close-up images of an individual petal displaying its veins, edge, colour gradient and folds (Fig. 9). These three types of image would present the petal as a transitional form between a concealed layer and an independent surface.

Captions to such illustrations should record the morphological process itself. For example: ‘A partially opened bud demonstrates the transformation of internal layers into visible petals’; ‘A many-petalled flower reveals the persistence of layered organisation after unfolding’; and ‘A close-up view of a petal reveals its own axis, growth lines, edge and surface structure’. Such formulations prevent the illustrations from being reduced to decoration and incorporate them into the analysis.

The petal as a former layer also possesses philosophical significance. It demonstrates that independence arises from inclusion. The petal becomes an individual element only because it was previously part of a whole. Its freedom to unfold does not negate its origin within a layer. This is an important morphological idea: the individual is not opposed to the whole, but constitutes one phase of its unfolding. Within the Matrix, parts are not merely added to the whole; they are differentiated from it.

This approach also helps to clarify broader forms of development. In many systems, elements become independent after having formed part of a concealed or denser structure. A branch emerges from a trunk, a leaf from a bud, a fracture from stress, a layer from accumulation and a symbolic motif from an overall composition. The petal is a biologically clear example of this general principle. It demonstrates that differentiation is the emergence of distinctions from a unified structure, rather than the mechanical assembly of ready-made components.

In this sense, the petal may be called the manifested part of a latent whole. It retains its connection with the centre, the former layered packing of the bud, the axis of the flower and the future cycle. It is visually independent, but not morphologically autonomous. Its form has meaning only as part of the flower. An individual petal may be beautiful, but its full morphogenetic significance is revealed through its relationship with the bud, centre, other petals, edge, function and cycle.

The petal also emphasises that the unfolding of form always involves a change in relationships. Within the bud, the petal is connected with neighbouring petals through dense overlapping. In the open flower, it is connected with them through radial arrangement. In the bud, it faces inwards or is compressed. In the flower, it faces outwards. In the bud, its edge is concealed. In the flower, its edge is active. In the bud, it protects. In the flower, it attracts and participates in the open structure. The same element passes through a change in relationships, and it is this change that creates morphogenesis.

This change in relationships is one of the key features of Stages C and D. A form develops not only because its elements change shape, but also because they change their position within the system. The petal does not merely flatten out; it changes its function, position, visibility, relationship with the environment and relationship with the centre. Morphogenesis must therefore describe not only the geometry of an element, but also its systemic status. The petal as a former layer is an ideal example of such a systemic change.

The petal ultimately permits a deeper understanding of the flower as a local model of the Matrix. The flower is composed not of randomly arranged beautiful parts, but of formerly concealed layers that have unfolded, acquired independence and formed radiality, edges, surfaces and functional space. Each petal bears the trace of the bud while simultaneously participating in the flower's mature unfolding. It connects past closure with present manifestation.

Within the hypothesis of the Unified Matrix of the Universe, the petal may therefore be interpreted as a former layer of the closed floral structure. Within the bud, it formed part of the internal packing and of the protective and morphogenetic order. During unfolding, it separated, opened out its surface and manifested its edge, colour, veins, folds and subsidiary axis. Within the open flower, it became an independent element of the radial composition while retaining its connection with the centre, axis and memory of the bud.

The petal demonstrates the transformation of concealed layering into manifested form. It is not only a decorative part of the flower, but morphological evidence of a process: the layer became a surface, the shell became an edge, the internal structure became external beauty, and the closed Matrix of the bud unfolded into a many-petalled system. The following section will examine the internal architecture of petals and leaves—their veins, fibres and growth lines as a map of flows of matter, water, energy and development.

9.4. Veins, Fibres and Growth Lines

Having considered the petal as a former layer, it is necessary to turn to its internal architecture. Petals and leaves are not homogeneous surfaces. Their visible beauty and form are connected with an underlying organisation: veins, fibres, growth lines, microfolds, colour transitions, tissue texture and the direction in which matter is distributed. Within the hypothesis of the Unified Matrix

of the Universe, these elements are particularly significant because they reveal not only the external contour of a form, but also the internal map of its becoming.

Veins, fibres and growth lines demonstrate that the unfolded surface of a living form is the result of organised distribution. This is especially apparent in the leaf: the midrib, lateral veins and fine network connect the base with the periphery, distribute water, minerals and the products of photosynthesis, and provide mechanical support for the surface. In petals, the veins and fine lines may be more delicate and less functionally conspicuous than in leaves, but they likewise reveal the direction of growth, tissue structure, supply pathways and internal organisation of the surface.

In the preceding chapters, the leaf was considered a universal model of the unfolded plane. This proposition may now be refined using biological material. A leaf surface is not merely a plane unfolded in space. It is a distribution system. The principal axis of the leaf passes into a network of veins; the network organises the tissue; the tissue forms the surface; and the surface terminates at the edge. Such a structure demonstrates how form maintains the relationship between centre, base, axis and periphery. The leaf may be read as a map of flows in which every line participates in the overall function of life.

The petal is organised differently but retains the same general principle: its surface also possesses an internal directionality. Fine veins, colour bands, lines of microrelief or fibrous structures frequently extend from the base of the petal towards its edge. They may be barely perceptible or, conversely, strongly pronounced. They may function as visual guides towards the centre of the flower, create a colour gradient or emphasise the petal's form. In every case, they demonstrate that the petal is not a passive decorative plate. It possesses an internal morphology.

Biologically, leaf veins are primarily associated with the plant's vascular system. They transport substances and support the form. In petals, the vascular elements may be finer and less visible, but they are likewise incorporated into the structure of the floral organ. Veins must therefore not be understood merely as a 'pattern'. They are material lines of the plant's life. Their aesthetic expressiveness is secondary to their morphogenetic and functional role. The beauty of venation arises because the processes of life leave a visible trace upon the surface.

This proposition is fundamental to the Matrix hypothesis. When a form contains lines, they must be analysed not merely as visual elements, but as traces of distribution. Within a living form, a line frequently represents a pathway: a pathway of water, matter, growth, stress, mechanical support, colour formation or functional interaction. A vein is not an ornament, but an organised channel. A fibre is not an accidental stripe, but an element of tissue structure. A growth line is not decoration, but a trace of the direction of development.

Veins and fibres therefore make it possible to pass from external morphology to internal dynamics. The contour of a leaf or petal reveals the boundary of the form. Its veins, however, reveal how the form is constructed from within. They connect centre and edge, base and apex, principal axis and local regions of the surface. Without veins, the leaf blade would be poorly organised and unstable. Without internal lines, the petal would lose a considerable part of its structural expressiveness. Veins make the surface legible as a process.

Several levels of venation may be distinguished in a leaf. The first is the midrib, which establishes the axis. The second consists of the lateral veins branching from the main line. The third comprises the fine veins forming a network. The fourth consists of microscopic regions of tissue bounded by this network. This hierarchy makes the leaf a natural fractal-like structure. The

principal line generates smaller lines, the smaller lines generate still finer ones, and the entire system preserves the general principle of distribution from the base towards the periphery.

In the petal, this hierarchy may be subtler, finer and less geometrically apparent. A direction from the base towards the edge, a fan-like divergence of lines, delicate vascular or pigment structures, colour rays and longitudinal fibres may nevertheless often be observed. These elements make the petal a local map of unfolding. If the flower as a whole unfolds from the centre towards the periphery, each petal unfolds from its base towards its outer edge. The logic of the entire flower is thus repeated at the level of the petal.

Veins and fibres also demonstrate that form develops through connection rather than through isolated parts. The petal as a former layer becomes an independent element, but its independence does not entail separation from the centre. Through its base and internal lines, it remains connected with the receptacle, the flower's overall structure and the plant. The leaf is connected with the stem through the petiole and midrib. Every small part of its surface is incorporated into the network. A living organ is therefore a system of connections rather than a collection of autonomous details.

This is especially important to an understanding of the Matrix as a morphogenetic code. In a living form, the code is manifested not only through the contour, but also through connectivity. The axis, network, edge, surface and layers form an integral system. Veins are the visible expression of this connectivity. They demonstrate that form possesses an internal routing system. Substances, water, signals, stresses and growth are distributed not arbitrarily, but along particular pathways. Venation may therefore be considered one of the most concrete biological realisations of structural order.

Growth lines differ from veins in that they are not always vascular structures in the strict sense. They may be traces of directed tissue development, folds, surface expansion, colour transitions, stresses or microstructure. In petals, growth lines are frequently visible as delicate longitudinal striations, ribs, bands or fibrous patterns. They indicate how and in which direction the surface unfolded. Whereas a vein is a channel, a growth line may be the trace of a trajectory of becoming.

In this sense, growth lines are morphologically similar in function to geological layers or folds: they record the history of formation. Biological tissue and geological rock are, of course, governed by different mechanisms. In both cases, however, a line may constitute a record of a process. In a petal, it records tissue growth; in a leaf, distribution and support of the surface; in stone, layering, pressure or mineralogical transition; in a nebula, a front or filamentary structure of matter; and in culture, a compositional line or direction of ornamental movement. Biological material provides the clearest and most natural example.

Fibres likewise possess a dual significance. On the one hand, they are material components of tissue. On the other, they create visual directionality upon the surface. The fibrous structure of a petal or leaf demonstrates that the surface possesses an internal orientation. It may extend along the axis, diverge in a fan-like pattern, follow the curvature of the petal, reinforce its edge or emphasise a fold. Fibres make the surface sensitive to direction. It is not identical at every point; it is organised.

This understanding is important when analysing the flower as a local model of the Matrix. An open flower is often perceived as a whole: centre, petals, colour and radiality. A close-up view of a petal, however, reveals that every element is itself a complex structure. It contains lines, microrelief, colour gradients, edges, waves and folds. The flower proves to be a system of nested

surfaces. Its large-scale radiality is repeated in the small-scale directionality of the petal. This constitutes the biological nesting of the Matrix.

Veins and growth lines also clarify the relationship between form and flow. In a living system, a flow need not be visible as movement. It may be inscribed within the structure. A leaf vein indicates the pathway of water and substances even when their movement cannot be directly observed. A coloured line on a petal may indicate the direction of tissue development or visual guidance. A fibre reveals the orientation of the material. In this sense, form is a static map of flows. It records movement within structure.

This is especially important to the Matrix because morphogenesis is always associated with the transfer of energy, matter and organisation. Form does not arise as immobile geometry. It emerges through the distribution of flows. In a plant, these include water, nutrients, products of photosynthesis, regulatory processes and growth stresses. In a flower, they also include interaction with pollinators, light, moisture and air. The lines on a petal or leaf are therefore visible traces of the form's participation in exchange.

Leaf veins may be considered a network. A network differs from a simple line because it connects multiple points. It enables the distribution of substances, supports the surface and ensures stability. Leaf venation may be pinnate, palmate, arcuate, parallel, reticulate or of another type. Each type of venation expresses a particular strategy for organising the surface. The analysis of veins may therefore be parametric: it is important to identify the principal axis, determine how the lateral lines branch from it, how they interconnect, how they reach the edge, how they form cells, and how they relate to the overall contour.

In petals, the network may be less pronounced, but the principle of directed distribution remains. The lines may run almost parallel, diverge from the base in a fan-like pattern, form delicate rays of colour or almost disappear within a uniform colouration. The absence of clearly visible lines, however, does not imply the absence of internal organisation. It may simply be concealed, microscopic or expressed through other features: a colour gradient, texture, curvature, edge or fold. Analysis of the petal must therefore consider not only obvious veins, but also subtler indications of growth.

Veins and growth lines are also connected with the edge. In a leaf, lateral veins may approach the edge and influence its form. The serrations of the edge sometimes correspond to vein endings. Undulations of the edge may be associated with uneven tissue growth. In a petal, growth lines may extend towards the edge, accentuate its curvature and produce waves or folds. The edge is therefore not an independent contour. It is frequently the result of internal distribution. Internal lines seem to emerge at the periphery and form its rhythm.

This is especially important to understanding the serrated and undulating edges considered previously. The edge of a form is active because the internal organisation reaches it. It does not exist separately from the veins, layers, facets, fibres and growth. In a flower, the petal edge is the termination of a former layer, but also the termination of an internal line. In a leaf, the edge is the outer limit of the network. The active edge is therefore the place where the internal architecture encounters the external environment.

Veins and fibres are also associated with the fold. A fold frequently follows lines of stress or growth. A petal may curve in the direction of its fibres. A leaf may fold along its midrib or lateral veins. Before unfolding, a young leaf may be folded in such a way that its veins become the lines

along which it will subsequently open. Venation therefore not only distributes, but also participates in the mechanics of unfolding. The lines of a form may also be lines of movement.

Within the bud, the petals are folded and their future growth lines remain partly concealed. As the flower opens, these lines become visible. Veins and fibres therefore participate in the transition from Stage A to Stage D. At Stage A, they may form a concealed architecture; at Stage B, the beginning of unfolding; at Stage C, the network of a growing surface; and at Stage D, the visible map of a mature form. Veins and growth lines thus pass through a morphogenetic path of their own.

In a mature flower, the lines of the petals may direct the gaze towards the centre. This possesses not only aesthetic, but also functional significance. In nature, bands of colour, contrasts and guiding structures frequently help orient pollinators. Morphologically, this means that the line becomes a means of connection between the periphery and the centre. The petal not only unfolds outwards from the centre; it may also direct attention and movement back from the edge towards the centre. A bidirectional relationship thus arises: the centre unfolds towards the edge, while the edge leads back towards the centre.

This bidirectionality is important to the Matrix. Morphogenesis must not be understood solely as a unidirectional movement outwards from the centre. Feedback relationships arise within the unfolded form. The periphery influences the centre, the edge interacts with the environment, colour and lines direct movement towards the centre, and pollination initiates a new cycle. The flower demonstrates that the unfolding of form creates a system of reciprocal directions. Veins and growth lines are visible channels of this reciprocity.

The leaf likewise demonstrates feedback between periphery and centre. Water and substances move through the network, but the leaf surface also affects the organism as a whole through photosynthesis and exchange. The edge of the leaf interacts with the environment, the surface receives light, and the results of this interaction return to the plant. Venation therefore not only carries the internal outwards, but also connects the external with the internal. The network functions in both directions: from base to periphery and from surface to organism.

In the petal, the functional connection is different, but the principle remains: the unfolded surface encounters the external world and returns this contact to the centre of the flower and the reproductive cycle. Colour, scent, form, lines, texture and edge operate as a system of interaction. The petal must therefore not be considered separately from the flower as a whole. Its veins and growth lines form part of a larger communicative structure.

Veins and fibres also help to clarify the concept of a ‘map’. A map need not be a consciously created representation of a territory. Morphologically, a map is a structure in which the distribution of elements reveals pathways, connections and relations between parts. Leaf veins constitute a map of the distribution of substances. The lines of a petal constitute a map of growth and visual direction. Folds constitute a map of stresses. The edge constitutes a map of interaction with the environment. Plant form may therefore be read as a morphological map of a process.

Such a reading must be undertaken cautiously. A plant must not be credited with consciously drawing a map. The point is that the structure of a leaf or petal objectively records pathways of distribution and directions of development. The researcher may read these pathways as a map. In this sense, the map is an analytical concept. It helps us see form not as a decorative surface, but as a system of organised connections.

Veins and growth lines are also related to energy. In biology, energy is associated with metabolism, photosynthesis, growth and tissue maintenance. The leaf is an organ in which light energy is transformed into a process of life. Its veins distribute the necessary substances and products of metabolism. A petal does not perform the same photosynthetic function to the same degree, but it participates in the energetically demanding process of flowering and reproductive interaction. Lines on a plant surface may therefore be understood as traces of energetically organised form.

The word ‘energy’ must be used rigorously here. It does not denote an indeterminate mystical force. In the biological context, it refers to actual processes of exchange, growth, water movement, turgor, photosynthesis, metabolism and interaction with the environment. If the book refers to ‘flows of energy’, this must mean precisely these functional and physical-biological processes, rather than some abstract emanation of form. This approach preserves the scientific validity of the hypothesis.

Water plays a particular role in the structure of the leaf and petal. Plant form is deeply connected with water relations. Veins transport water, turgor affects the unfolding of tissues, and environmental humidity influences the condition of the surface and edge. Water balance may be highly significant in the unfolding of petals and leaves. Growth lines and veins may therefore also be considered elements of the plant’s hydraulic architecture. Form unfolds not only through a genetic programme, but also through the physical state of its tissues.

This again demonstrates that the Matrix is not a purely abstract schema. Biological form is realised through material processes. Veins are not symbols in themselves, but concrete plant structures. Fibres are not metaphors, but components of tissue. Growth lines are not merely visual patterns, but traces of development. The biological level of the Matrix must therefore be the most materially grounded. Here the hypothesis has the opportunity to draw upon actual processes of morphogenesis.

Veins are also associated with mechanical stability. The leaf blade is thin, but its veins enable it to retain its form, resist bending, distribute loads and support the surface. Mechanical support may be subtler in petals, but tissue structure still determines how a petal curves, holds its position, unfolds or droops. Lines and fibres are therefore not only channels, but also architectural elements. They enable a surface to exist as a form.

This architectural role of veins is particularly important when comparing plant forms with human constructions. Architecture frequently employs ribs, frames, grids, shells, folds and facets to support surfaces. Plant form provides a natural example of such structural logic. This comparison must, however, remain morphological: a leaf vein and an architectural rib have different origins, but both perform functions of support and load distribution within a surface. This type of comparison will be useful in the chapters on culture.

In the context of the flower, veins and growth lines explain how a petal may be delicate yet structurally expressive. Its surface is supported by its internal tissue organisation rather than by external rigidity. It may curve, tremble and respond to moisture and time, yet retain its form long enough to fulfil its function. The petal is therefore an example of the Matrix’s soft architecture: a structure need not be rigid in order to be organised.

Soft architecture is especially important at the biological level. Living form is frequently constructed not through rigid geometrical elements, but through tissues, membranes, turgor, fibres, elasticity, growth and self-regulation. Petals and leaves exemplify precisely this soft

structural organisation. They may be thin, flexible and changeable, but their organisation is not arbitrary. Veins, fibres and growth lines maintain order within softness.

This makes it possible to refine the concept of the Matrix. The Matrix is not a rigid lattice. In biology, it is manifested as a flexible organisation. It permits curves, waves, variations, folds, damage and uneven growth. At the same time, it preserves a structural principle: base, axis, network, surface, edge, and connection with centre and environment. Veins and fibres are visible expressions of this flexible organisation. They demonstrate that order may be soft.

The internal architecture of petals and leaves is also associated with the concept of a gradient. Colour, density, thickness, moisture, fibre direction and intensity of venation may change from base to edge or from centre to periphery. A gradient represents not a sharp division, but a gradual transition. In a petal, colour may be saturated at the base and become lighter towards the edge, or vice versa. Veins may be thicker at the base and finer at the periphery. Surface texture may change gradually. Such gradients are important features of unfolding.

Within the Matrix, the gradient demonstrates that form develops through transitions rather than only through boundaries. The layer and facet record distinctions, whereas the gradient records gradual change. Such transitions are particularly important in biological form. A petal is rarely divided into absolutely rigid zones. Its structure frequently changes smoothly. This makes it a living surface. Analysis of the Matrix must therefore take into account not only lines and edges, but also soft transitions between zones.

Colour gradients in petals may be associated with attraction and navigation. They may guide the gaze or movement towards the centre, mark an entrance into the flower, reveal the depth of the corolla or emphasise the edge. Morphologically, they function as lines without a rigid contour. This broadens the concept of the growth line: a line may be not only a physical vein, but also a direction of colour, a gradient, a band or an optical pathway. Within the flower, visual structure becomes part of biological communication.

Veins and growth lines also make it possible to analyse the petal's relationship with its former status as a layer. Within the bud, the petals were folded, and their lines may have been compressed, curved and partly concealed. As the flower opens, these lines unfold but often retain their curvature. Close examination of a petal may reveal traces of its packing: the direction of folds, curvature of the edge, changes in texture and lines of tension. The petal therefore preserves the memory of the bud not only in its general form, but also in the microstructure of its surface.

This memory of form is especially important to the chapter. The bud was the closed Matrix; the petal is a former layer; and the veins and growth lines form a map of unfolding. Together, they demonstrate that the flower is not an instantaneous image. It is a history recorded within tissues. The centre, petals, veins, edges and folds are not separate decorative features, but different levels of a single morphogenetic memory.

Close-up images of petals and leaves are especially important to the illustrative sequence accompanying this section. Such images may display delicate veins, fibrous structure, coloured lines, folds, microrelief and transitions from base to edge (Fig. 10). Images of leaves with a clearly defined midrib and branching network, in which the hierarchy of distribution can be readily seen, would also be useful (Fig. 11). A third type may consist of comparative images of a petal and leaf, revealing similarities in their surface organisation despite their different biological functions (Fig. 12).

Veins and fibres also help distinguish strong morphological correspondence from weak visual analogy. If two forms possess only a similar external contour, the correspondence is weak. If, however, they can be shown to possess similar internal arrangements of lines, axes, networks, edges and gradients, the correspondence becomes stronger. This is especially evident at the biological level: leaves and petals may differ in function, but possess comparable elements of unfolded surface morphology. Such a comparison has morphological significance.

It will be important to retain precisely this principle when moving subsequently to the geological and cosmic levels. Similarity of edge or colour is insufficient. The internal lines, distribution structure, levels, boundaries, directionality and connection with the process must also be analysed. Biological material teaches discipline of observation. It demonstrates that form is read not through a single impression, but through a system of features. Veins, fibres and growth lines provide training in this kind of reading.

Philosophically, these structures demonstrate that life inscribes its pathways upon the surface. Leaves and petals are not only forms, but also traces of the movement of matter, growth, time and interaction. Their lines indicate how the form came into being. In this sense, the surface of a living organ is an open page of morphogenesis. It does not explain everything, but provides an opportunity to see internal order in its manifested form.

The transparency of this page must not, however, be exaggerated. Not everything occurring within the plant is visible at the surface. Veins and growth lines reveal important features, but do not encompass the plant's biochemistry, genetics, cellular regulation, hormonal processes and developmental mechanisms. Morphological reading must therefore be combined with an understanding of biology. At the biological level, the Matrix does not replace botany, plant anatomy or physiology. It offers a means of seeing general structural relations within already known biological forms.

Veins, fibres and growth lines also help to explain why the flower may serve as a key to reading morphogenesis. In a flower, form unfolds both externally and internally. Petals reveal former layers; veins reveal pathways of distribution; coloured lines reveal directions of perception; folds reveal the memory of the bud; edges reveal interaction with the environment; and the centre reveals the reproductive node. All this makes the flower a compact but exceptionally rich model of the process.

If the bud was the closed Matrix, its veins and growth lines constitute its unfolded script. They reveal how internal order became visible not only in the general radiality, but also within the delicate tissue of every element. The flower must therefore be read at several scales: the entire flower, the individual petal, the lines of the petal, its edge and the microstructure of its surface. This multilevel character makes it especially valuable to the hypothesis.

The section on veins and growth lines thus completes the transition from the flower's general form to its internal morphology. The centre, axis and radiality described its large-scale architecture. The petal as a former layer described the origin of the elements of its unfolded form. Veins, fibres and growth lines reveal how those elements are internally organised. The flower now appears not merely as an unfolded composition, but as a network of flows, surfaces, boundaries and directions.

Veins, fibres and growth lines in petals and leaves are therefore among the most important features of the biological level of the Matrix. They reveal the internal architecture of the unfolded form, the map of flows of matter and water, the direction of growth, mechanical support, the

relationship between base and edge, centre and periphery, and latent and manifest. They demonstrate that the plant surface is not a passive shell. It is an organised system in which every visible trace may be connected with a process of becoming.

The internal architecture of petals and leaves makes morphogenesis legible. Veins reveal pathways of distribution; fibres, the orientation of tissue; growth lines, the trajectory of unfolding; colour gradients, visual and functional directionality; and folds and edges, the memory of stress and interaction with the environment. Through these features, the flower becomes not a metaphor for the Universe, but a local biological model of how form unfolds its internal order outwards. The following section will conclude the chapter and demonstrate why the flower may serve as a key to reading morphogenesis.

9.5. The Flower as a Key to Reading Morphogenesis

The flower is one of the most expressive biological forms through which morphogenesis may be read as a process. It displays almost all the principal elements considered in the preceding chapters: closed potentiality, a centre, a concealed axis, radiality, layering, the fold, petal unfolding, the active edge, growth lines, an internal network, interaction with the environment and the transition to a new cycle. The flower therefore occupies a special place within the hypothesis of the Unified Matrix of the Universe. It does not in itself constitute evidence of a universal law, but it provides a convenient local model in which morphogenetic logic is manifested with a high degree of clarity.

The principal methodological qualification is that the flower must not be understood as a metaphor for the Universe in a literal sense. It does not explain the cosmos, constitute a miniature copy of the Universe or demonstrate that all natural and cultural forms are organised identically. Such a claim would be excessive and scientifically vulnerable. A more precise formulation is that the flower is a local biological model of the universal process through which form unfolds. It demonstrates how the latent becomes manifest, how the centre unfolds into the periphery, how a layer becomes an element, how the edge becomes active, how form reaches maturity and how a new cycle is prepared.

The flower is therefore a key not to a direct explanation of the entire world, but to the reading of morphogenesis. It teaches us to see form not as a finished image, but as the result of successive stages. The closed bud represents Stage A—compressed potentiality. The beginning of the bud's opening represents Stage B—the first outward emergence of the internal. The separating petals, layers, veins and edges represent Stage C—the multilayered structure. The fully open flower represents Stage D—maximum manifestation. The transition to fruit and seed represents the return to a new A. The flower thus becomes a living example of the A–B–C–D model.

The bud as a closed Matrix demonstrates that a future form may be folded within a compact state. It contains the future flower not as a completed miniature, but as an internally organised possibility. The petals, centre, radiality, edges and growth lines remain concealed within the bud but have already been prepared. The bud therefore demonstrates a fundamental principle of morphogenesis: visible simplicity may be folded complexity. What appears externally closed and at rest may internally be undergoing active preparation.

The opening of the bud demonstrates that form does not appear suddenly. It emerges through a threshold. The shell ceases to provide protection alone and becomes a site of transition. The petals begin to separate, the folds open out, the centre is gradually exposed, and the future radiality becomes visible. This process represents the transition from containment to manifestation. The flower reveals that morphogenesis is not an instantaneous change of state, but a sequence of unfoldings, each connected with a preceding latent order.

The centre of the flower is one of the principal elements in this reading. It organises the unfolded form, maintains the relationship between the petals, directs perception, participates in reproductive function and connects with the future cycle. The centre, however, does not exist separately from the axis. Before unfolding, the flower was a bud connected with the stem, base and direction of growth. In the open state, the axis may visually dissolve into the radial form, but morphologically it remains. The flower teaches us to recognise a concealed axis even where the eye primarily perceives a circular or radial composition.

The flower's radiality demonstrates the transition from a closed centre to an open periphery. The petals extend around the central region, forming a spatial and functional system. Radiality is not merely geometry, but a mode of unfolding. Through it, internal organisation becomes external structure. The flower demonstrates that radiality may be strict, approximate, spiral, bilaterally symmetrical or asymmetrically organised. The floral model therefore does not require perfect symmetry. It demonstrates a deeper principle: form unfolds around a centre, even when its particular realisation includes variations.

The petal as a former layer reveals another important principle. Within the bud, the petal formed part of a closed layered structure. It protected, overlapped, contained and belonged to the internal packing of the form. Within the open flower, it becomes an independent element, acquiring a surface, colour, edge, line, curvature and function. This transformation of a layer into a petal demonstrates that elements of an unfolded form often possess a concealed prehistory. They do not simply appear as separate parts; they are differentiated from a previous wholeness.

Veins, fibres and growth lines make the flower particularly valuable as an object of analysis. They make it possible to read not only its contour, but also the internal architecture of its surfaces. Petals and leaves reveal pathways of distribution, directions of growth and connections between base and edge, and between centre and periphery. Lines upon a plant surface are not decorations, but traces of living processes. They demonstrate that form arises through flows of matter, water and energy, growth, stress and interaction with the environment. The flower becomes not only an image of unfolding, but also a map of unfolding.

The flower thus makes it possible to combine several levels of morphological reading. At the first level, the general form is visible: bud, unfolding, centre, petals and radiality. At the second, the structure of the parts becomes visible: petals, layers, edges, folds and facets. At the third, the internal architecture of the surfaces is revealed: veins, fibres, growth lines, colour gradients and microrelief. At the fourth, the cycle becomes visible: the flower is connected with the fruit, seed and new development. This multilevel character makes the flower an especially convenient model for analysing the Matrix.

The flower also demonstrates that morphogenesis cannot be reduced to geometry alone. Floral geometry is important, but inseparable from the living process. The centre, radiality, petals and growth lines are connected with tissue development, the function of pollination, interaction with the environment and the reproductive cycle. The biological level of the Matrix is therefore particularly valuable: here the form does not merely resemble a schema, but actually develops,

grows, unfolds and participates in a living process. The flower makes it possible to discuss morphogenesis not abstractly, but at a materially concrete level.

In this respect, the flower differs from a cultural symbol or visual analogy. A symbol may resemble a flower, a mandala may possess radiality, an ornament may reproduce a petal-like structure, and a cosmic nebula may visually resemble an unfolded form. The flower, however, is a living object of morphogenesis. Its structure has a biological basis. Analysis of the flower must therefore precede more speculative comparisons with geological, cosmic and cultural forms. It establishes a discipline of reading: first the process, then the form, and only then the analogy.

The flower also demonstrates that the beauty of form may be the consequence of an organised process. Its expressiveness arises not from arbitrary decoration, but from the coordination of centre, axis, petals, colour, lines, edge and function. The beauty of the open flower is the visible aspect of its morphogenesis. It reveals how latent order becomes manifested diversity. Aesthetic impression, however, must not replace analysis. It may initially attract attention, but must then lead to a description of structure, function and process.

The flower is especially important to understanding the relationship between part and whole. Each petal forms part of the flower, but possesses its own internal organisation: a base, subsidiary axis, lines, edge, folds and coloured surface. The flower as a whole possesses a centre, radiality, periphery and cycle. The plant, as a larger whole, incorporates the flower into its living system. The seed formed after flowering may become the beginning of a new plant. The flower is therefore a node of nested levels: the petal within the flower, the flower within the plant, the plant within the life cycle, and the seed as a new beginning.

This nesting makes the flower particularly important to a fractal understanding of the Matrix. The issue is not a strict mathematical fractal. The flower does not repeat itself infinitely and is not a perfect formula of self-similarity. It does, however, display natural multilevel organisation: the centre of the flower and the bases of the petals, the radiality of the whole and the directionality of its individual elements, the veins of the petals and the larger structure of the corolla, the edges of the petals and the overall edge of the floral form. Organisational principles recur at different levels with variations.

The flower also demonstrates the relationship between symmetry and asymmetry. It may possess radial symmetry, but a real flower is never absolutely mathematically perfect. Its petals may differ slightly, its edges may be uneven, its growth lines individual, and its unfolding partial or non-uniform. This variability does not destroy the floral form. On the contrary, it makes it living. The flower demonstrates that the Matrix is manifested not through mechanical repetition, but through organised variation.

This is why the flower is important to an understanding of the universal and the individual. A general floral type may recur in numerous plants, but every individual flower possesses its own history of unfolding. Its form depends upon the species, genetics, environmental conditions, nutrition, light, water, time and contingent influences. A universal morphogenetic principle is realised within an individual form. This is one of the principal lessons of the biological level of the Matrix: universality does not abolish individuality, but manifests itself through it.

The flower also helps to clarify the role of the environment. The bud is closed, but not isolated. The open flower is exposed to light, air, moisture, pollinators and time. Its form exists in constant interaction with the surrounding world. The petals do not unfold in empty space, but within an environment. The centre of the flower is connected with the reproductive process. Colour, scent,

lines, form and edge are embedded within ecological relations. The flower therefore demonstrates that morphogenesis cannot be understood solely as an internal programme. It is the result of internal organisation and external conditions.

This idea is important to the entire hypothesis. The Matrix must not be understood as a rigid blueprint that creates form independently of the environment. At the biological level, it is clear that form is realised through interaction. A seed requires conditions for germination. A bud requires conditions for opening. A petal forms within the particular condition of the plant. A flower enters into relationships with pollinators and its environment. The Matrix is therefore not a schema of predetermination, but a schema of organised becoming under conditions of interaction.

The flower also demonstrates that complete unfolding is not the final state. The open flower may appear to be the culmination of the process, but its biological meaning is connected with continuation. The flower opens the way towards fruit and seed. Its centre is not only the focus of beauty, but also the node of the future cycle. The flower therefore demonstrates the transition from D to a new A. The complete manifestation of form becomes the condition of a new folding. In this sense, the flower is not only a model of unfolding, but also a model of cyclicity.

It is through the flower that the non-linear nature of the Matrix can be understood with particular clarity. The bud opens into the flower, the flower passes into the fruit, the fruit contains seeds, and the seeds begin a new cycle. This cycle, however, is not a simple repetition. Each new seed enters a different environment and may produce a new individual form. The flower therefore combines the circle and the spiral: it completes one turn and prepares another. In biology, this logic is particularly convincing.

The flower also provides a convenient model for subsequent comparative analysis. Once the centre, axis, radiality, layer, petal, vein, edge, fold and cycle have been identified at the biological level, it is possible to proceed cautiously to other levels: geological structures, cosmic forms, artefacts and symbolic systems. The flower, however, establishes a standard of rigour. In other domains, it is not sufficient merely to search for external resemblance to a flower. Structural relationships must be sought: where is the centre, where is the axis, where are the layers, where are the lines of distribution, where is the edge, where is the latent stage, where Is the unfolding, and where is the new cycle?

This is especially important when working with images. A flower may visually resemble a nebula, a succulent may resemble a galactic spiral, and a petal structure may resemble an ornament or mandala. Visual resemblance, however, is only the beginning of the question. A proper analysis must determine which features correspond: centred organisation, radiality, layering, an undulating edge, growth lines, spirality or cyclicity. If only the general impression coincides, the analogy remains weak. If several structural features coincide, a stronger morphological correspondence may be identified. The flower helps to establish this scale.

At the biological level, this scale is particularly clear. The bud and open flower are connected processually, so their correspondence with Stages A–B–C–D is strong. The petal and leaf possess different functions but comparable surface morphologies, so their correspondence is partial and structural. The succulent rosette and flower bud are not identical, but demonstrate a similar principle of centred, layered packing and may therefore be compared morphologically. A cosmic nebula resembling a flower may be compared only with caution and at a weaker level unless the physical mechanisms have been analysed.

This approach preserves the scientific discipline of the hypothesis. The flower must not become a pretext for arbitrary extension. On the contrary, it should become a means of developing precise morphological observation. It clearly demonstrates that every form possesses a stage, function, material, process, environment and cycle. If these parameters are disregarded, the Matrix becomes a collection of attractive analogies. If they are taken into account, it becomes a working language of analysis.

The flower is also important as a transition between nature and culture. Human culture has repeatedly used floral forms: rosettes, wreaths, lotuses, mandalas, ornaments, capitals, domed structures and floral symbols in religious and artistic language. This is not accidental. The flower possesses a powerful morphological expressiveness: a centre, layers, radiality, unfolding, beauty and the cycle of life. The cultural use of the flower must nevertheless be analysed separately. The biological flower is a natural object, the cultural rosette a human form, and the symbolic flower a system of meanings. The Matrix makes it possible to compare them, but not to conflate them.

In this sense, the flower is a bridge, but not evidence. It connects living morphology, aesthetic perception and symbolic thought. Human beings perceive the flower as an image of unfolding because the flower genuinely is an unfolding form. Floral symbolism has a morphological basis, but cannot be reduced to it. Subsequent chapters on culture may therefore use the flower as a point of comparison while preserving the distinction between biological process and cultural interpretation.

The flower also helps to demonstrate that the Matrix possesses not only a structural, but also a temporal character. A flower cannot be understood from a single state. The closed bud, partially open bud, open flower, wilting flower, fruit and seed are different moments within a single process. If only the open flower is considered, its beauty and radiality may be seen, but its latent preparation and future cycle are lost. If only the bud is considered, potentiality may be seen, but not the manifested form. The flower must therefore be read sequentially through time.

This temporal reading must become a general principle in the analysis of the Matrix. In relation to any form, it is necessary to ask not only ‘what is it?’, but also ‘how did it become?’, ‘what did it conceal?’, ‘how did it unfold?’, ‘which traces of the process did it preserve?’ and ‘what may it generate subsequently?’. The flower is a convenient object through which to learn this way of thinking because its stages are clearly distinguishable and readily observable. It demonstrates that morphology without time is incomplete.

The flower also demonstrates the relationship between the internal and external. Within the bud, the internal is protected. During unfolding, the internal becomes external: the petals, centre, colour, lines and edges emerge. Even in the open flower, however, concealed levels remain: cellular structure, biochemistry, genetic regulation and physiological processes. Unfolding is therefore never absolute. It makes one level visible while leaving others concealed. The flower teaches us that manifestation is always multilevel.

This proposition is especially important to the hypothesis as a whole. When an unfolded form is observed, it must not be assumed that it has been completely understood. The visible Matrix is only one layer. Behind it lie processes, mechanisms, history, environment, function and scale. The flower helps to preserve this distinction: its petals and centre are visible, but their development requires biological explanation. The Matrix as a morphological language must therefore work in conjunction with the specific sciences rather than replace them.

At the biological level, the functional character of form is especially clear. The bud protects, the petal unfolds and attracts, the veins distribute, the edge interacts, the centre participates in reproduction, and the fruit preserves the future seed. Every part performs a role. Even where the form is perceived as beautiful, its organisation cannot be reduced to beauty. The flower therefore demonstrates the unity of form and function. This unity is one of the principal features of a strong morphogenetic analysis.

The flower also makes it possible to refine the concept of a 'local model of the Universe'. Strictly speaking, the Universe is too vast, multilevel and physically diverse to be reduced to a flower. A local model, however, means something different: a general principle of form generation may be seen within a small form. The flower demonstrates how the potential becomes manifest, how the centre becomes the periphery, how layers become elements, how lines organise a surface, how the edge completes the unfolding, and how the complete form prepares a new beginning. In this limited and precise sense, the flower genuinely constitutes a local model of morphogenesis.

This approach makes the flower not an object of worship or a mystical symbol, but an instrument of research. It helps to formulate questions about other forms. Does the form possess a closed stage? Is there a centre or region of concentration? Is there an axis? How do radiality or directionality arise? Which elements were previously layers? How are its lines of distribution organised? How is its edge active? How does the form pass into a new cycle? If the flower helps us formulate these questions, it performs the function of a key.

The flower also demonstrates that morphogenesis may be read from whole to part and from part to whole. It is possible to begin with the open flower and proceed to the petal, vein, edge and cellular structure. It is possible to begin with the bud and trace its unfolding towards the flower and seed. It is possible to begin with a petal and recognise within it a small model of the flower. It is possible to begin with the centre and trace the radiality towards the periphery. This multidirectional reading makes the flower an especially rich object for the Matrix.

In this sense, the flower is not merely an illustration of a pre-existing schema. It helps us understand the schema itself. The flower makes clear why Stage A must be closed, why Stage B is associated with a threshold, why Stage C is multilayered, why Stage D is not a final state, why the edge is active, why a layer may become an element, why centre and periphery are connected, and why form preserves the memory of its unfolding. The flower makes the abstract model visible.

To conclude the chapter, it is important to emphasise that the biological level of the Matrix is not exhausted by the flower. Leaves, roots, trees, fruits, seeds, tissues, vascular networks and other living structures may also be considered within this logic. The flower, however, provides an especially useful starting point because it concentrates numerous features within a single expressive form. It provides a route towards other biological objects and subsequently towards the other levels of the Matrix.

The chapter's conclusion may be illustrated by the following sequence: closed bud—partially open bud—open flower—close-up view of a petal—veins and growth lines—fruit or seed (Fig. 13). Such a sequence would present the flower not as an isolated image, but as a process. Another useful option would be an A–B–C–D schema based upon the flower: A—the bud; B—the beginning of opening; C—the separating petals and layers; D—the open flower; and the new A—the seed (Fig. 14). These illustrations could provide a visual conclusion to the chapter.

The principal conclusion of the chapter is that the flower constitutes a key to reading morphogenesis because the process through which form unfolds is represented within it

sequentially, materially and with visual clarity. The bud contains the future form in compressed state; the centre and axis organise the unfolding; radiality translates the internal into the external; the petals demonstrate the transformation of layers into independent elements; veins and growth lines reveal the internal architecture of flows; the edge records interaction with the environment; and the fruit and seed return the process to a new beginning.

Fig. 1. Closed Bud as a Model of Compressed Floral Form: Future Petals and the Centre Concealed within an Enclosing Structure

Fig. 2. Succulent Rosette as a Morphological Example of Centred, Layered Packing of Elements

Fig. 3. Partially Closed Floral Structure: Transition from a Concealed Layer to a Visible Petal and the Onset of Opening

Fig. 4. Open Flower with a Clearly Defined Centre and Radial Arrangement of Petals

Fig. 5. Floral or Succulent Rosette with a Spiral-Radial Organisation of Elements around the Centre

Fig. 6. Flower Viewed from the Side or in Partial Section: Relationship between the Centre, Base, and Concealed Growth Axis

Fig. 7. Partially Open Bud: Transformation of Internal Layers into Visible Petals

Fig. 8. Multi-Petalled Flower as an Example of the Preservation of Layered Organisation after Opening

Fig. 9. Close-Up of a Petal: Its Own Axis, Growth Lines, Folds, Colour Surface, and Active Margin

Fig. 10. Close-Up of a Petal: Growth Lines, Fibrous Structure, Colour Guides, and Transition from Base to Margin

Fig. 11. Leaf Venation Network: Central Vein, Lateral Veins, and Hierarchical Distribution of Flows towards the Periphery

Fig. 12. Comparison of a Petal and a Leaf as Two Unfolded Plant Surfaces with Different Functions but Similar Morphological Organisation

Fig. 13. Sequence of Floral Morphogenesis: Closed Bud — Partially Open Bud — Open Flower — Petal — Growth Lines — Fruit or Seed

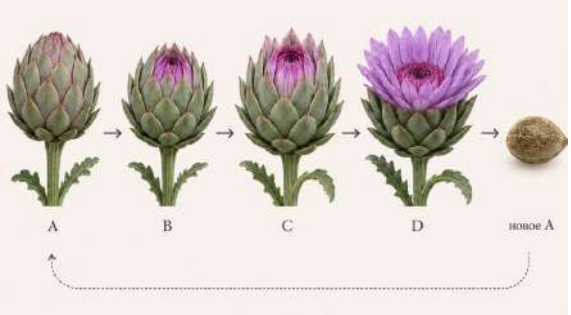

Fig. 14. Biological A–B–C–D Scheme Using a Flower as the Model: A — Bud, B — Initial Opening, C — Multilayered Opening of the Petals, D — Open Flower, New A — Seed

Chapter Ten

Seed Structures, Fruits and the Reproduction of Form

10.1. The Seed as Beginning and Outcome

The seed occupies a central place at the biological level of the Matrix because it unites beginning and completion with exceptional clarity. In the preceding chapters, the seed was considered primarily as an originating form, a closed potentiality and Stage A of the A–B–C–D model. The biological cycle, however, presents a more complex picture: the seed not only initiates the process of development, but also completes the process that preceded it. It appears after flowering, fruiting, maturation and the transmission of the morphogenetic principle. The seed is therefore simultaneously the beginning of a future form and the outcome of an already completed cycle.

This duality makes the seed one of the key biological models within the hypothesis of the Unified Matrix of the Universe. If the bud was the closed Matrix of the flower, the seed is the closed Matrix of an entire new organism. It contains not the unfolded form in its complete external manifestation, but the possibility of future unfolding. No tree, leaves, flowers, fruits or new seeds are visible within it, yet it carries the conditions required for their future emergence. The seed therefore demonstrates that form may exist not only as a manifested structure, but also as compressed potential.

The seed must not be understood as a simple miniature of the future plant. It does not contain a completed adult plant in reduced form. It contains an embryo, nutrient reserves, protective coats, hereditary information, a physiological state of dormancy and the capacity to enter into development under particular conditions. It is neither a mechanical blueprint nor a completed model of the future form, but an organised potential. The seed establishes a range of possible development, while the particular plant will form through interaction with soil, water, temperature, light, its microenvironment and contingent circumstances.

This is precisely why the seed provides such an accurate image of the Matrix. Within the hypothesis, the Matrix is understood not as a rigid, completed schema, but as a system of morphogenetic invariants and possibilities. The seed operates in a comparable way: it preserves the principle of the future form without containing every detail of its future individual realisation. It preserves the type while permitting variation. It establishes a beginning without negating the role of the environment. It carries the memory of the past while remaining open to the future.

As a beginning, the seed is associated with closure. It possesses a coat, a boundary, compactness, internal organisation and a state of waiting. Its external form is frequently simple: rounded, oval, teardrop-shaped, elongated, flat, granular, smooth, rough or ribbed. This simplicity, however, does not signify impoverishment. The seed contains a complex biological potential. In this sense, it repeats the fundamental principle of Stage A: minimal external differentiation combined with high internal significance.

As an outcome, the seed is associated with memory. It does not arise from nothing, but results from a preceding cycle: the plant grew, formed leaves, a flower, reproductive structures, a fruit or seed-bearing structure, and then transmitted the future form into a new compact state. The history of the preceding development is folded within the seed. This history is not always externally visible, but it is present in material, hereditary and morphological continuity. The seed is the outcome of an unfolded form returned once again to closed potentiality.

The seed is therefore a nexus of time. It faces backwards because it carries the result of the preceding cycle. It faces forwards because it is capable of beginning a new cycle. Past and future exist within it in a state of compression. The seed is not merely an object between two stages, but a transitional structure in which completion and beginning coincide. In this respect, it is one of the most profound biological models of the cyclical nature of the Matrix.

Within the A–B–C–D model, the seed corresponds to Stage A. Following Chapter 8, however, this must be refined: it is not only the initial A, but also the new A that follows Stage D. The open flower, fruiting and maturation lead to the formation of the seed. Stage D of the preceding cycle therefore returns to Stage A of the next. The seed demonstrates this transition more clearly than any other biological object. It is the point at which an unfolded form becomes a closed form once again.

This return to closure is not a regression. The seed does not mean that development has simply moved backwards. On the contrary, it means that the result of the preceding cycle has been preserved in a form capable of further development. The flower unfolded, but its unfolding did not disappear without consequence. The fruit matured, but its function is not confined to completion. The seed arose as a compact vehicle of continuation. The new closure following unfolding is therefore not a loss of form, but a means of transmitting it.

The seed is particularly important because it combines two opposing states: repose and the possibility of movement. In its dormant state, a seed may be preserved, await suitable conditions, be transported and survive unfavourable periods. It may be dry, hard and outwardly inactive. This repose, however, is not an empty cessation, but the preservation of viability. Under suitable conditions, the seed begins to germinate. The closed structure then unfolds, the seed coat is ruptured, the radicle appears, followed by the shoot, and a new morphogenetic cycle begins.

Seed dormancy may be described as active potentiality. Outwardly, the seed does not grow, but internally it preserves the possibility of growth. This state is important to understanding the Matrix. Not every form that has yet to unfold is dead or devoid of content. On the contrary, some forms must remain closed in order to preserve the possibility of future unfolding. The seed demonstrates that closure may be a condition of life. While the form is not ready or conditions are unfavourable, closure protects its potential.

The seed coat performs a particular morphological role. It separates the internal from the external, protects the embryo and nutrient reserves, regulates interaction with the environment and helps to maintain dormancy. During germination, however, this same coat must be overcome. It may rupture, soften or open at a particular region. The seed coat therefore possesses a dual meaning: it protects the beginning while simultaneously constituting a future threshold. This repeats the logic of the boundary considered earlier: the boundary first contains and subsequently opens.

The relationship between form and threshold is particularly clear in the seed. Germination does not begin arbitrarily. It requires particular conditions: moisture, temperature, access to oxygen and, depending on the plant species, sometimes light or a particular treatment of the seed coat.

Until this threshold is reached, the seed remains at Stage A. Once it is crossed, Stage B—the first unfolding—begins. The radicle emerges, a direction becomes manifest, and the original closure is disrupted. The seed thus displays the precise transition from a potential form to an active form.

The first germination of the seed is one of the clearest biological examples of symmetry breaking. The closed seed may appear compact and relatively whole. During germination, however, a direction emerges: the root grows towards the soil and moisture, while the shoot grows towards light and air. A vertical polarity arises. The internal becomes external. Stage A passes into B. This moment demonstrates that development begins not with a complete form, but with the first axis, first emergence and first distinction.

The seed also demonstrates that the beginning of form is always connected with the environment. Even when the seed possesses potential, it cannot realise that potential independently of suitable conditions. Soil, water, temperature, air, light, microorganisms, spatial orientation, depth below the surface and mechanical obstacles all influence germination and subsequent development. The seed as Matrix is therefore not an autonomous, closed cause. It is an internal potential that becomes form only within a system of relationships.

This proposition is fundamental to the hypothesis as a whole. If the Matrix is understood as an entirely self-sufficient code, this may lead to the mistaken idea of complete predetermination. The biological seed demonstrates the opposite: internal order is necessary, but insufficient. Form arises from the interaction of internal organisation and external conditions. The Matrix must therefore be understood as a structural possibility realised within an environment, rather than as an immutable blueprint that automatically produces the same result.

The seed also carries variability. Seeds from the same plant or species may be similar, yet every new plant that develops from them will follow an individual trajectory. Even when they share a general hereditary type, their particular forms depend upon conditions and contingent events. This is especially important to understanding the universal and the individual. The seed preserves the invariant without eliminating variation. The Matrix operates through the recurrence of a principle, not through the mechanical copying of an external appearance.

The compressed form of future multilayeredness may be seen within the seed. Before the plant has grown, its future roots, stem, leaves, flowers, fruits and new seeds exist only as a potential trajectory. During development, however, this trajectory will unfold through a sequence of stages: germination, axial direction, branching, leaf formation, flowering, fruiting and the production of new seeds. The seed therefore contains not merely one future form, but the possibility of an entire cycle. It is not only the beginning of an object, but also the beginning of a process.

As an outcome, the seed is also associated with selection. Not every unfolded form produces a viable seed. A flower may not be pollinated, a fruit may fail to mature, a seed may be non-viable, or the conditions of dispersal may be unfavourable. The transition from an unfolded form to a new seed is therefore not automatic. It requires the successful completion of the biological cycle. This avoids an excessively simple schema: D does not invariably pass into a new A. When such a transition does occur, however, the seed becomes the vehicle of continuation.

In this respect, the seed is a criterion of the cycle's completion. An open flower may appear aesthetically complete, but biologically the cycle achieves continuation only when the possibility of a new seed arises. Biological maturity cannot therefore be reduced to visible beauty. Flowering is important, but forms part of the broader process of reproduction. The seed demonstrates that

the highest point of a form's manifestation must be connected with the transmission of that form into the future.

The seed is also connected wIth the fruit, which will be considered in the following section. The fruit may be understood as a structure in which the result of flowering is organised around the seeds. It protects, nourishes, disperses or contains the seeds, frequently transforming the singular flower into a multiplicity of future beginnings. It is already important to emphasise here, however, that the seed rarely exists as an isolated outcome. It is connected with the fruit, surrounding coats, the medium of dispersal and mechanisms of transmission. The seed is the centre of the future cycle, but this centre is frequently incorporated within the more complex structure of the fruit Matrix.

The seed as both beginning and outcome also demonstrates the relationship between singularity and multiplicity. One seed may produce one plant. One plant may produce numerous seeds. A single flowering may lead to a large number of potential beginnings. Biological reproduction is therefore not a simple return to a single point. It is frequently a multiplication of possibilities. A completed form may generate not one new A, but many new instances of A. This already prepares the subject of the fruit as a matrix of multiplicity.

The multiplicity of seeds is particularly important to understanding the generative nature of the Matrix. If every cycle returned to only one seed, the model would remain relatively simple. In reality, biological form frequently produces a surplus of potentialities. Numerous seeds are dispersed throughout the environment, and only some of them germinate. The Matrix therefore operates not only through the precise reproduction of a single beginning, but also through the distribution of numerous possible beginnings. The future of form becomes probabilistic and dispersed.

The seed may also be considered a form of biological memory. This memory possesses several levels. The first is hereditary and connected with the transmission of traits. The second is material and associated with the seed's nutrient reserves and structure. The third is morphological and associated with the type of future development. The fourth is ecological and associated with the method of dispersal and conditions of germination. The fifth is cyclical and derives from the seed's status as the result of a preceding life process. These levels make the seed not a simple object, but a vehicle of continuity.

The memory of the seed must not, however, be understood as a complete record of the future. The seed does not contain every detail of the future form in advance. It preserves the principle and possibilities while leaving space for development. Its memory is therefore open memory. It contains the past without closing the future. In this sense, the seed is one of the clearest images of the spiral cycle: the past returns, but is not repeated literally.

The seed also demonstrates that something small may contain the possibility of something much larger. This is not a mystical claim, but a biological fact: a small structure may develop into a plant that greatly exceeds it in size, complexity and functional richness. Morphologically, this means that the scale of the beginning and the scale of the result may differ significantly. The Matrix operates not through the simple preservation of size, but through the unfolding of potential. A small beginning may develop into a large structure if it preserves the relevant principle and the environment permits growth.

This transition from the small to the large is connected with fractal logic. The seed produces a plant; the plant produces numerous new seeds; and each of these may produce another plant.

Within the plant, branching, leaves, flowers and fruits repeat the principles of centred organisation, axis, unfolding and new beginnings. The seed is not a fractal in the strict mathematical sense, but it participates in a self-similar logic of life: the part contains the possibility of the whole, while the whole produces new parts capable of becoming wholes. This makes the seed a key element in the biological fractality of the Matrix.

The seed also possesses its own morphology. It is not only a functional vehicle of the future, but also a form. Seeds may be rounded, flat, winged, downy, spiny, smooth, ribbed, heavy or light; they may be enclosed within a fruit or exposed, and occur singly or in large numbers. Their form is frequently related to their method of dispersal: by wind, water, animals, mechanical projection or falling close to the parent plant. Even at the stage of closed potentiality, the seed's form therefore carries a trace of its future movement through the environment.

This point is especially important: even a closed seed may be organised not only for preservation, but also for dispersal. A winged seed already contains the form of flight. A seed with hooks already contains the possibility of attachment to an animal. A light seed with down is already connected with the wind. A heavy seed within a fruit may be associated with animals or with falling into the soil. The seed as Stage A is therefore not passive. Its external form may be prepared for future movement—that is, for the search for conditions in which a new cycle may begin.

In this sense, the seed is not only internal memory, but also a strategy for entering the world. It must separate from the parent form, be transported, survive, find a suitable environment and cross the threshold of germination. The seed therefore combines closure and mobility. It is closed within itself, but open to movement through space. This duality makes it especially interesting for morphological analysis: a form may be compact while simultaneously being adapted to dispersal.

The seed also demonstrates that a new cycle may begin through separation. While the seed remains within the fruit or attached to the plant, it is connected with the preceding cycle. To begin a new cycle, it must often separate, fall, be transported and pass through the environment. Separation does not mean a rupture of continuity; it is a condition of independent development. A new A arises when the result of the preceding D acquires the possibility of following its own path. This is another aspect of the transformation of a part into a whole.

The separation of the seed possesses philosophical significance. A new form cannot develop solely as a continuation of the old shell. It must acquire its own space, conditions and trajectory. The seed separates from the plant while preserving its principle. This demonstrates that continuity is not equivalent to dependence. A new beginning inherits the past but must enter into its own interaction with the environment. This is the profound logic of biological reproduction.

The seed is also associated with the concept of latent multiplicity. One fruit may contain many seeds. One plant may produce many fruits. A single flowering may produce numerous potential cycles. Before germination, this multiplicity has not yet become a multiplicity of plants. It exists as a multiplicity of closed potentialities. This is a highly significant point: the future may be represented not by a single line, but by many possible lines. Here the Matrix is revealed as a field of possibilities.

Not all of these seeds will germinate. This demonstrates that the biological cycle contains elements of selection and probability. The Matrix does not guarantee the realisation of every possibility. It creates potential, but what follows depends upon conditions. The seed as a form of the future is therefore always associated with uncertainty. It may become a plant, remain

dormant, die, be eaten or be transported into an unsuitable environment. Possibility is not necessity. This is important to a rigorous understanding of the hypothesis.

The seed also demonstrates that form may be temporarily suspended. Some seeds may remain viable for a certain period while dormant. Morphologically, this means that a cycle may contain a pause. A does not necessarily pass immediately into B. A period of waiting may occur between the outcome of the preceding cycle and the beginning of the next. The A–B–C–D model must therefore include not only movement, but also delay. The seed is a form in which time is deferred into potentiality.

This delay makes the seed particularly significant to the philosophy of form. The future does not disappear within it, but is postponed. It may be preserved until conditions become suitable. The seed thus connects form and time not only through development, but also through waiting. It demonstrates that morphogenesis includes not only growth, but also the capacity not to grow until the appropriate moment. This too forms part of order.

At the biological level of the Matrix, the seed may be considered a minimal wholeness. It is small, but contains a boundary, internal organisation, reserves, an embryo, the potential of an axis, a future relationship with the environment and the capacity to enter a cycle. Minimal wholeness differs from a fragment in that it can become the beginning of an independent process. A fragment may be only part of the past, whereas the seed is part of the past and the beginning of the future. This makes it a distinctive type of morphological object.

The seed also makes it possible to refine the concept of the ‘local centre’. A plant contains many centres of growth and development: buds, flower buds, meristems, flowers, fruits and seeds. The seed is the centre of a future organism, but in the preceding cycle it formed part of the fruit, while the fruit formed part of the plant. The centre is therefore not an absolute point. It may arise within a larger structure and subsequently become an independent beginning. The seed demonstrates how a local centre separates and becomes a new morphogenetic centre.

This proposition is important to understanding nested cycles. The plant as a whole may have reached Stage D of its development, while new instances of A are forming within it as seeds. These new instances of A may leave the parent system and begin cycles of their own. One cycle does not therefore merely end and begin again; it may divide into numerous subsidiary cycles. The biological Matrix is not a single line, but a branching system of cycles.

In this respect, the seed is connected not only with the circle and spiral, but also with the network. One plant may produce numerous seeds; the seeds disperse in different directions; some germinate and form new plants, which subsequently produce new multiplicities of seeds. A network of generations, spaces, environments and developmental lines arises. The seed as beginning and outcome therefore demonstrates that the cycle of the Matrix may be simultaneously circular, spiral and networked. Biological reproduction extends the A–B–C–D model to the population and ecological levels.

The present chapter must nevertheless remain focused on the morphogenesis of form. The seed is considered not as an exhaustive object of genetics, ecology or agronomy, but as a biological structure demonstrating the transition from a completed cycle to a new beginning. This does not negate scientific data, but establishes the level of analysis. The concern here is how form is preserved, folded, transmitted and unfolded once again. The seed provides the principal biological answer to this question.

Images of seeds in different states are particularly important to the illustrative sequence accompanying this section. The first image may show a dry, closed seed as a compact form of potentiality (Fig. 1). The second may show a germinating seed whose coat has already been ruptured and from which the radicle is emerging—the transition from Stage A to Stage B (Fig. 2). The third may be a diagram or sequence showing 'flower—fruit—seed—seedling', presenting the seed as both the outcome and the beginning of a cycle (Fig. 3). Such images will make the seed's dual nature clearly visible.

The image of a germinating seed will be particularly important. It demonstrates that a new cycle begins through the disruption of the preceding closure. The radicle emerging from the seed is the first axis of the future plant. The coat that previously provided protection becomes a boundary that has been overcome. The closed form enters its environment. This is an ideal biological illustration of the A → B transition and a clear demonstration that the seed's closure was not empty, but potential.

Images of different types of seed would also be useful. They may demonstrate that the seed as Stage A does not possess a single geometrical form. Some seeds are rounded, others elongated; some possess wings, others are covered with hairs, and still others are enclosed within a hard coat. This diversity is important to the hypothesis: the Matrix is manifested not through identical outward appearances, but through a common morphogenetic function. Different forms of seed perform one key task—to preserve and transmit the possibility of a new cycle.

The seed also possesses cultural and philosophical significance, but in this chapter it must remain primarily a biological object. In different cultures, the seed frequently symbolises beginnings, life, the future, rebirth, latent power and fertility. These meanings are intelligible precisely because the biological structure of the seed genuinely contains a future form in a latent state. Symbolism must, however, follow biology rather than replace it. The seed is a powerful symbol because it is a powerful morphogenetic form.

Philosophically, the seed expresses the category of potential being. It already exists, but has not yet become what it is capable of becoming. It is real, but its future form has not yet been manifested. It is small, but contains the possibility of something large. It is closed, but directed towards unfolding. It is an outcome that functions as a beginning. This combination of opposites makes the seed one of the most important concepts in the entire study. Within it, the Matrix is presented in an extremely compressed form.

The seed also helps us understand that the completion of form does not always take the form of openness. The flower is open and the fruit may be mature, but the seed is closed once again. The completion of one cycle may therefore assume a closed rather than an open form. This is an important qualification of aesthetic perception. We often perceive the open flower as the culmination of form, but biologically the culmination of the cycle may be connected with the production of a new closed beginning. The Matrix is therefore not reducible to unfolding; it includes both unfolding and a new folding.

This new folding is particularly important to understanding reproduction. For a form to continue, it must be transmitted in a compact and stable form. The seed performs this task. It does not preserve all the visible elements of the unfolded plant, but preserves the possibility of their re-emergence. In this sense, the seed is a mechanism for transmitting the invariant. It transmits not form as an image, but form as a capacity for development.

It is here that the seed becomes the key to a biological understanding of the invariant of the Matrix. The invariant does not signify an identical outward appearance. It signifies a recurring processual structure: a closed beginning, germination, axis, branching, leaves, flowering, fruiting and a new seed. The seed ensures the recurrence of this logic. Every new unfolding, however, will possess its own trajectory. The biological invariant therefore exists through variable reproduction.

The seed as outcome and beginning also prepares the analysis of the fruit. If the seed is the unit of a new cycle, the fruit is a structure that frequently organises many such units. The fruit demonstrates how the singular unfolding of a flower may pass into a multiplicity of future beginnings. It protects and contains the seeds, contributes to their nourishment and dispersal, and structures their arrangement. The analysis of the seed must therefore be followed by consideration of the fruit as a matrix of multiplicity.

Within the hypothesis of the Unified Matrix of the Universe, the seed is thus one of the principal biological forms of the cycle. It initiates the process while simultaneously completing it. As a beginning, it represents the closed potentiality of the future form. As an outcome, it constitutes the folded memory of the preceding cycle. It unites protection and readiness for unfolding, repose and the possibility of movement, past and future, singularity and multiplicity, inheritance and variation.

The seed is not merely an initial point, but a morphogenetic node. It arises after the flower has opened and the fruit has matured, yet itself becomes the beginning of a new unfolding. It preserves the principle of form without predetermining every detail of future development. It is Stage A arising after Stage D—the new seed of a spiral cycle. This is why the seed makes it possible to understand biological reproduction as the return of form to potentiality for the sake of a new unfolding.

10.2. The Fruit as a Matrix of Multiplicity

If the seed represents both the beginning and the outcome of the biological cycle, the fruit constitutes the structure in which that outcome assumes the form of multiplicity. The flower reveals the centre, petals, radiality and reproductive function; the seed preserves the potential for a new plant; the fruit connects these two states. It emerges after flowering and becomes a matrix within which the outcome of the unfolded form is organised, protected, brought to maturity and prepared for dispersal. Within the hypothesis of the Unified Matrix of the Universe, the fruit may therefore be regarded as the biological form of the transition from a singular unfolding to a multiplicity of new potential beginnings.

The fruit is not merely a container for seeds. In morphogenetic terms, it is a complex system in which the outer covering, internal structure, seed chambers, partitions, flesh, skin, axis, radiality, layering and mode of opening or dispersal form a unified organisation. The seeds are not simply located within it at random. They are arranged in a particular way, connected to the tissues of the fruit, protected, nourished and brought to maturity, after which they are able to separate, disperse or be transported elsewhere. The fruit is a form that contains multiplicity until its release into the environment.

Within the biological cycle, the fruit arises after the stage of floral opening. The flower was the stage of manifestation: its centre was exposed, its petals unfolded and its structure entered into

interaction with the environment. This is followed by a new transition towards closure. Yet this closure differs from that of the bud. The bud concealed the future flower; the fruit conceals future seeds. The bud was the matrix for the unfolding of the floral form; the fruit is the matrix of reproduction and multiplicity. Both are closed, but their functions differ. The bud prepares for flowering; the fruit prepares for continuation.

The fruit demonstrates a crucial principle: the complete unfolding of a form may end not in disappearance, but in a new enfolding. The flower has opened, but after this opening its reproductive centre may proceed to form the fruit. The outward beauty of the petals may disappear, yet the morphogenetic process continues in another form. What was open becomes closed once again. This new closure, however, does not return the process to an earlier state; it preserves the outcome of the unfolding and transforms it into a multiplicity of seminal possibilities.

It is for this reason that the fruit may be called a matrix of multiplicity. A single floral structure may produce numerous seeds. A single unfolding may give rise to numerous new beginnings. The single centre of a flower may develop into a system of seed chambers, cells, rows, locules, spirals or radially distributed elements. A singular form becomes a field of potential forms. The fruit demonstrates that a completed cycle may not simply repeat itself, but may multiply its future trajectories.

This multiplication is particularly important for understanding the biological Matrix. The seed as a new A may be singular, but the fruit often contains many such As. Each seed is a potential centre of a future cycle. The fruit may therefore be understood as a structure in which numerous future centres are temporarily contained within a single maternal whole. It is not merely a protective covering, but an organisation of future multiplicity.

Within the A–B–C–D model, the fruit occupies a distinctive intermediate position. It emerges after stage D of floral opening, yet itself contains new instances of stage A in the form of seeds. In this sense, the fruit lies at the boundary between cycles. For the flower, it is an outcome. For the seeds, it is a protective and nutritive environment. For future plants, it is the antecedent state of their potentiality. The fruit cannot therefore be assigned to only one simple stage. It is a transitional matrix between a completed form and a multiplicity of new beginnings.

The fruit demonstrates that stage D may generate not one new A, but an entire set of new As. This is particularly important for the development of the A–B–C–D model. If the cycle is conceived as a single line, one new seed follows the unfolding. Biological reality, however, is often more complex: one plant produces many flowers; one flower or inflorescence may produce many fruits; and one fruit may contain many seeds. The cycle therefore becomes branched. The biological Matrix does not merely return to the beginning; it distributes the beginning across multiple points.

In this sense, the fruit is connected with the fractal logic of form. It is part of a plant, yet it contains within itself future whole plants. It may be a small organ in relation to the parent organism, but each seed within it carries the potential for a new organism. The part contains numerous future wholes. This is not fractality in the strict mathematical sense, but a biological, self-similar logic of reproduction: the whole produces parts, the parts become potential wholes, and the new wholes produce parts once again.

Fruits in which seeds are arranged radially, spirally, in rows, chambers or cells are particularly expressive (*Fig. 4*). Such forms allow us to perceive the fruit not as an amorphous mass, but as a

structured Matrix. Seeds may be grouped around a central axis, positioned along the inner walls, enclosed within separate locules, arranged in rows or distributed across the surface of the fruiting structure. In each case, the fruit displays a particular order of multiplicity.

The centre of a fruit may take different forms. In some fruits, it is expressed as an axis around which the seed chambers are arranged. In others, it takes the form of a cavity around which the flesh and seeds are organised. In still others, it is the central region to which the seeds are attached. In a fourth type, it exists as a hidden line of origin extending from the floral centre. Even when the centre is not externally visible, it is often retained morphologically. The fruit continues the logic of the flower: the centre does not disappear, but is transformed into a structure for storing and distributing seeds.

The axis of the fruit is likewise of considerable importance. In many fruits, it is possible to identify a direction extending from the stalk to the apex, an internal central line, or an axial arrangement of seed locules, partitions or tissues. This shows that the fruit, like the flower, is not simply a sphere or an undifferentiated mass. Its form is often organised around a concealed axis. Even when the fruit appears rounded externally, its interior may possess a clearly defined axial and radial structure. A cross-section of the fruit frequently reveals what had remained hidden from view.

A cross-section of the fruit is particularly important for morphological analysis. The outer surface displays the contour, colour, skin and overall form. It is the cross-section, however, that reveals the internal Matrix of multiplicity: chambers, seeds, partitions, radial lines, layers of flesh, centre and periphery. Whereas the flower displays an outward unfolding, the fruit often requires the opposite direction of observation—an inward gaze. Its structure becomes legible only when it is opened or sectioned. The fruit is therefore a form in which morphogenesis becomes concealed once again and requires an analysis of internal organisation.

This distinguishes the fruit from the open flower. The flower is demonstrative: it displays its petals, centre, colour, lines and edge. The fruit is more restrained: it often encloses its seeds, concealing them within flesh or protective coverings until they mature. The flower is a form of manifestation; the fruit is a form that preserves the outcome. Yet the fruit is no less complex. Its hidden organisation may be even more important to the continuation of the cycle than the outward beauty of the flower.

The fruit also demonstrates the relationship between layering and protection. Its skin, outer covering, flesh, partitions, seed chambers and internal membranes form a layered system. The outer layer protects it from the environment; the internal layers nourish or hold the seeds; the partitions organise its internal space; and the seed coat protects each individual seed. The fruit is therefore a multilayered protective structure. Within it, the principle of the layer operates not as decorative depth, but as a condition for the maturation and transmission of future form.

A layer within a fruit has a different meaning from a petal within a flower. The petal unfolded outwards, became visible and participated in the radial composition. The layers of the fruit, by contrast, often contain and enclose. They are not necessarily intended for outward display. Their purpose is to protect, nourish, separate, preserve and prepare for dispersal. The fruit therefore represents the reverse phase of morphogenesis: once the petals have unfolded, a new layered closure arises, directed not towards manifestation but towards preserving the future.

The fruit is not always concealed, however. Some fruits become brightly coloured, succulent, conspicuous, fragrant and attractive to animals. In such cases, the external form of the fruit

participates in seed dispersal. Its colour, taste, scent and form become means through which it enters into ecological relationships. This demonstrates that the fruit's closure is relative. It may enclose its seeds while simultaneously opening itself to the environment as a signal. Protection and attraction are combined within a single structure.

Such a fruit is particularly significant for the Matrix because it combines internal multiplicity with external communication. Outwardly, the fruit may be vivid and whole. Internally, it contains numerous seeds. Its external form is directed towards the environment, while its internal form is directed towards the future cycle. It exists between present and future, between plant and animal, and between protection and dispersal. The fruit is therefore not merely a biological organ, but also a nexus of relationships.

The fruit as a matrix of multiplicity is also connected with the theme of distribution. The seeds within a fruit must be arranged in such a way that they can mature, receive resources, remain protected and ultimately be dispersed. This arrangement may be dense or loose, symmetrical or asymmetrical, radial or linear, chambered or superficial. In every case, the fruit solves the problem of organising a multiplicity within a unified form. It demonstrates that multiplicity requires structure.

In this sense, the fruit may be regarded as a biological model of an organised multiplicity. The multitude of seeds within it is not chaotic. It is connected with the tissues, axis, partitions, surface and points of attachment. Even when the seeds appear to be scattered at random, their arrangement often has a morphogenetic basis. The fruit is therefore a valuable object for analysing how the Matrix passes from a single centre to multiple centres.

The idea of 'multiple new centres' is particularly important. Each seed within the fruit is a potential centre of a future plant. While the seeds remain within the fruit, they are subordinate to its overall structure. Once separated, they may become independent beginnings. The fruit therefore contains future centres in a state of common dependence. It is a temporary whole for numerous future wholes. This is one of the most profound biological forms of the transition from part to whole.

The fruit also demonstrates that the reproduction of form is connected with separation. While the seeds remain within the fruit, they belong to the maternal structure. As the fruit matures, they may detach, emerge, disperse, be eaten and transported, fall to the ground or pass through other mechanisms of dispersal. What was once part of the fruit becomes an independent potentiality. The fruit is therefore a structure that prepares for separation. It contains multiplicity until that multiplicity is able to enter the environment.

This separation is not destruction in a negative sense. A ripe fruit may open, break apart, dry out, crack, decompose or be eaten, yet these processes often contribute to seed dispersal. Within the biological cycle, the breakdown of the fruit's outer covering may serve a functional purpose. The fruit must cease to be a closed matrix so that the seeds can begin a new cycle. Here, the general principle is again manifested: the boundary protects up to a certain threshold, after which it must be overcome.

In this sense, the fruit follows its own A–B–C–D trajectory. Initially, the ovary and young fruit constitute a closed, developing structure. The fruit then grows and becomes more complex, forming layers, seed chambers and tissues. It subsequently reaches maturity. Finally, opening, separation, dispersal or decomposition takes place, as a result of which the seeds become new

As. The fruit therefore not only contains new cycles, but is itself a cycle. It is a matrix within a matrix.

The fruit as a matrix of multiplicity also allows us to refine the concept of completion. The flower appears to be a complete form, yet biologically its completion proceeds into the fruit. The fruit appears to be a complete form, yet its meaning is connected with the seeds. The seed appears to be a complete compact form, yet its meaning is connected with future growth. At the biological level of the Matrix, completion is therefore always relative. Every completed form proves to be a transition to the next. The fruit demonstrates this sequence with particular clarity.

The fruit is also connected with the concept of excess. A plant often produces more seeds than will actually germinate. This is readily understandable in biological terms: the environment is unpredictable, and many seeds perish, fail to find suitable conditions or become food for other organisms. Morphologically, however, this means that the fruit creates a multiplicity of possibilities, only some of which will be realised. Here, the Matrix functions as a generator of potentialities. It does not lead along a single line towards a single outcome, but creates a field of future selection.

This excess is important for understanding living form. Biological reproduction is not the exact copying of a technical drawing. It involves probability, multiplicity, dispersal, loss, selection, chance and the environment. The fruit as a matrix of multiplicity makes this logic visible. It demonstrates that new form arises not only from order, but also from a distribution of possibilities. Order produces the seeds, but the environment determines which of them will become a new cycle.

A fruit may also be singular or multiple in its structure. Some fruits contain one seed, others several, and still others a great many. Some develop from a single flower, while others are associated with complex inflorescences. Some possess one chamber, whereas others have multiple locules, partitions or modules. This diversity demonstrates that the fruit Matrix does not possess a single external geometry. Its general function—the organisation and transmission of seeds—may be realised through different forms.

This diversity is particularly important for the hypothesis. The Matrix manifests itself not in all fruits looking externally alike, but in their fulfilment of a similar morphogenetic task: preserving the outcome of flowering, organising the seeds, preparing them for independence and ensuring the transition to a new cycle. The fruit should therefore be analysed in functional and morphological terms, rather than solely in visual ones. Outward similarity between fruits is not the principal consideration; what matters is their role within the cycle of form.

The fruit also demonstrates different strategies of interaction with the environment. Some fruits open and scatter their seeds. Others become food for animals, which subsequently disperse the seeds. Others possess wings or lightweight structures that enable dispersal by wind. Some can float on water. Still others have hooks or clinging elements. The morphology of a fruit is often connected with its particular strategy. The form of the fruit is therefore not merely the outcome of internal development, but also a response to the future mode of dispersal.

In this way, the future cycle is already encoded in the form of the completed organ. If a fruit is to open, its structure prepares lines of rupture or zones of release. If it is to be eaten, it may become conspicuous and nutritious. If the seeds are to be carried by the wind, the fruit or seed structure may become light, dry, winged or downy. The fruit is therefore a matrix not only of the seeds

themselves, but also of their future trajectory. It contains not only potential forms, but also the means by which they will enter the world.

The internal organisation of a fruit often displays radiality, chambered organisation or an axial structure. Cross-sections of certain fruits reveal stellate, radial or multilocular patterns. These patterns are especially important for illustrative analysis because they disclose the hidden geometry of multiplicity (*Fig. 5*). Externally, a fruit may appear to be an ordinary rounded body, while internally its seeds and partitions form a clearly defined order. A cross-section reveals the closed Matrix of the fruit.

Such images should be used with caution. The radial structure visible in a cross-section of a fruit does not in itself prove the universality of the Matrix. It does, however, provide a biological example of how internal multiplicity may be organised around a centre or axis. This is compelling morphological material because it is connected with the actual function of the fruit: the arrangement and protection of seeds. Cross-sections of fruits may therefore become important illustrations of the biological level of the Matrix.

The fruit also demonstrates the relationship between internal and external edges. Its external edge—the skin or outer covering—separates it from the environment. Its internal edges—the partitions, chamber walls and seed coats—organise the space within. The fruit therefore possesses a system of boundaries. One boundary protects the whole, while others divide the multiplicity within it. This makes the fruit particularly interesting for analysing the edge as a morphological category. Here, the edge is not merely an external contour, but also an internal architecture of separation.

The internal partitions of the fruit may be regarded as facets or internal boundaries of the Matrix. They divide space without destroying the whole. They allow the seeds to remain separate while simultaneously belonging to one fruit. This reflects a more general principle: multiplicity requires differentiation. For numerous seeds to mature within a single organ, there must be internal relationships, places, boundaries and points of attachment. The fruit demonstrates how a unified whole may contain an organised multiplicity through its internal structure.

The fruit also possesses temporal layering. A young fruit, a growing fruit, a ripe fruit, an overripe fruit and a fruit that is opening or decomposing represent different stages. One and the same organ changes in colour, density, form, taste, scent, mechanical properties and degree of closure. These changes demonstrate that the fruit is a process rather than a static object. Over time, its form progresses from development to maturity and subsequently to opening or decomposition.

The ripening of the fruit is especially important for the Matrix. This is the stage at which its internal multiplicity becomes ready for an independent future. Before ripening, the seeds are not yet ready and the fruit must retain them. After ripening, retention may give way to dispersal. Ripening is therefore a threshold. Before it, the fruit preserves; after it, the fruit transmits. In this sense, the ripe fruit corresponds to the transitional zone between D of the preceding cycle and A of the numerous future cycles.

The fruit as a matrix of multiplicity is also connected with the concept of concentration. Numerous seeds are temporarily gathered within a single organ. This represents a concentration of future possibilities. It is subsequently followed by a phase of dispersal. The seeds leave the fruit, spread through the environment, lose their spatial proximity and encounter their own

particular conditions. The fruit thus demonstrates a rhythm of concentration and dispersal. First, multiplicity is gathered within a single whole; it then spreads out into the world.

This rhythm has profound morphogenetic significance. The Matrix not only gathers form, but also distributes it. The seed concentrates future form within a single point. The fruit gathers numerous seeds. Dispersal distributes these points. Germination once again concentrates development around each new centre. The biological cycle thus continually alternates between concentration and dispersal, closure and opening, unity and multiplicity. The fruit is a central form within this alternation.

The fruit also allows us to understand the relationship between singular form and continuation at the population level. A single flower may produce seeds, but a multitude of seeds creates the possibility not merely of one new individual, but of an entire future generation. The fruit therefore extends morphogenesis beyond the individual organ. It connects the form of one plant with the future multiplicity of plants. In this sense, the fruit constitutes a biological mechanism through which the Matrix expands across space and time.

It is important, however, not to move entirely into the field of population biology in this chapter. Our primary concern is the morphology of the reproduction of form. The fruit demonstrates how the structure of one organism produces numerous new centres of development. It shows that reproduction possesses a form, not merely a function. The seeds are arranged, protected, organised and brought to maturity within a specific architecture. The structure of the fruit is therefore an important morphological object, rather than merely a stage in the life cycle.

The fruit is also an example of how a form may be internally closed and externally open at the same time. Its seeds are enclosed within it, yet the fruit may remain open to interaction with the environment through its colour, scent, taste, form and surface. It may attract animals, resist desiccation, defend itself, attach itself to other bodies, open or fall. Within it, the internal future and the external strategy are combined. This makes the fruit one of the most complex biological forms of the Matrix.

In some fruits, the dispersal strategy is expressed through opening. Pods, siliques, capsules and other dry fruits may open along lines, cracks or valves, releasing their seeds (*Fig. 6*). Such fruits are particularly interesting because they demonstrate how a new closed form once again proceeds towards opening. The outer covering of the fruit initially protects and then opens. The boundary once again becomes a threshold. This represents an almost direct repetition of the logic of the seed and bud, but at another level.

In other fruits, dispersal occurs while the fruit remains intact. The fruit may be eaten whole or transported, with the seeds being released later. Here, the outer covering of the fruit does not necessarily open mechanically; instead, it enters the ecological cycle through interaction with animals, water, soil or the passage of time. This demonstrates that the transition from fruit to seed may occur through different mechanisms. The Matrix establishes the general function of the transition, but not a single means of its realisation.

A fruit may retain its seeds in a strict order or within a looser mass. In some cases, the arrangement of the seeds is immediately visible: rows, chambers, radial locules or spirals. In others, it is concealed within the flesh or appears less regular. Yet even less regular fruits possess a biological organisation. The analysis must therefore be attentive: not every Matrix appears geometrically striking. Sometimes order is expressed functionally rather than decoratively.

This is important if the hypothesis is to be protected from aesthetic selectivity. One cannot select only beautiful radial or spiral fruits while disregarding all the others. If the Matrix is a scientific and philosophical model, it must also apply to simple, asymmetrical, inconspicuous, dry, deformed and purely functional forms. The fruit Matrix may be striking or modest, but its primary meaning is the organisation of future seeds. Beauty is not an essential criterion.

The fruit also demonstrates that multiplicity may be organised in various ways: through rows, chambers, a central axis, the surface, the flesh, dispersing elements or dense packing. This diversity is valuable for future classification. Fruits may be distinguished according to the type of seed distribution: axial, radial, chambered, superficial, spiral, dispersed, linear or locular. Such a typology may become part of the morphological methodology applied to the biological level of the Matrix.

The fruit as a matrix of multiplicity is also connected with the question of measure and packing. A certain number of seeds must be accommodated within a limited space. This requires a particular form of packing. Such packing may be dense, as in many multi-seeded structures, or loose. It may be optimised for protection, nutrition, dispersal or maturation. In this sense, the fruit presents a biological problem of spatial organisation. It demonstrates how a future multiplicity is temporarily packed into a single whole.

The concept of packing is particularly important to the relationship between the fruit and the spiral and radial distribution of seeds, which will be examined in the following section. Sunflowers, lotuses, poppy capsules, succulents and other structures demonstrate different ways of organising a multiplicity of potential beginnings around a centre, across a surface or within a volume. The fruit as a matrix of multiplicity prepares the ground for this analysis: the general function of the fruit must first be understood, followed by the specific patterns of seed distribution.

The fruit is also important as an example of biological architecture. Its internal structure may be compared to a house for seeds, although this comparison must remain metaphorical. In scientific terms, it is more precise to say that the fruit creates a space for protection, maturation and dispersal. It possesses coverings, chambers, partitions, supports, points of attachment and, in some cases, channels and zones of rupture. All this makes it an architectural form in the biological sense: it organises space for future centres of life.

In this respect, the fruit may be compared to an enclosed city of future beginnings: numerous seeds are temporarily located within a common structure, each having its own place, although each may later enter a separate space. This comparison is philosophically expressive, but the principal scientific meaning must be preserved: the fruit organises multiplicity. It contains numerous potential cycles within a single biological form.

The fruit is also connected with the transition from internal to external multiplicity. While the seeds remain within it, the multiplicity is internal. After dispersal, it becomes external: the seeds find themselves in different parts of the environment. Some of them subsequently germinate, and the multiplicity becomes a multitude of organisms. The fruit thus transforms internal multiplicity into spatial multiplicity. This is one of the most important mechanisms of biological reproduction.

This transition may be described as the unfolding of multiplicity. The bud unfolded into the flower. The fruit unfolds a multiplicity of future beginnings. In the first case, the petals and centre were revealed. In the second, the seeds and the potential for new plants are released. The fruit is

therefore another form of unfolding. Its opening may not always be as beautiful or radiant as that of a flower, but it has a more profound cyclical meaning: it brings future forms into the world.

In philosophical terms, the fruit demonstrates that the outcome of development may be greater than the outcome itself. The open flower is beautiful as a form, but the fruit shows that the true result of flowering lies not only in visible beauty, but also in the possibility of continuation. The fruit is evidence that form exists not only for manifestation, but also for transmission. Within the biological Matrix, unfolding and reproduction are inseparable. The fruit is the organ of this relationship.

The fruit as a matrix of multiplicity also demonstrates the relationship between internal protection and future freedom. The seeds are initially protected and connected. They must subsequently emerge and become independent. This reflects the general logic of development: a form initially requires an outer covering, but must later overcome it. The fruit renders this logic multiple. It protects not one beginning, but numerous beginnings, each of which may subsequently enter its own cycle.

In this sense, the fruit is a biological image of a future distributed across a multiplicity. It does not know which seed will germinate, where it will find itself or what trajectory it will follow. Yet it creates conditions for numerous possibilities. This makes the fruit particularly important for understanding the openness of the Matrix. The Matrix is not a single straight line leading from cause to outcome. It creates fields of potential continuations, from which different trajectories are realised.

The fruit also allows us to examine the boundary between the maternal form and the new form. A seed within a fruit is still connected with the parent plant, but biologically it already carries the capacity for future independence. Where does the preceding form end and the new one begin? The fruit is the space of this boundary. It belongs to the old cycle, yet contains new cycles. The fruit is therefore not merely an organ, but a zone of transition between generations of form.

This transitional character makes the fruit particularly important to the D → A model. Stage D of the open flower does not immediately become the seed. Between them lies the organisation of the fruit. It ensures maturation, protection and dispersal. The D → A transition may therefore possess an intermediate matrix. This refines the A–B–C–D model: a new A may not emerge instantaneously, but through a special structure of preservation and multiplicity. The fruit is such a structure.

The illustrations accompanying this section should show the fruit not only externally, but also internally. The whole fruit demonstrates integrity and its protective outer covering. A cross-section reveals the internal matrix of seeds. An opening fruit displays the transition from containment to dispersal. Together, these three perspectives will reveal the fruit as a process: enclosed multiplicity—organised internal structure—the release of seeds into the external environment.

At the same time, excessive symbolism must be avoided. The fruit need not be presented as a ‘cosmic container of life’ or a direct model of the Universe. Its strength lies elsewhere: it is a precise biological structure in which the organisation of numerous potential forms may be observed. The language should therefore remain morphological: the fruit as a protective structure, the fruit as a seed matrix, the fruit as an organisation of multiplicity, the fruit as a transition towards dispersal, and the fruit as an intermediate link between the flower and the new seed.

The fruit also demonstrates that biological form may function in several modes simultaneously. It is the outcome of the flower's development, a protection for the seeds, a means of dispersal, an object of interaction with the environment, a source of food for other organisms, an element of the ecosystem and the beginning of new plants. Its morphology is connected with all these modes. As an object of the Matrix, the fruit is therefore multivalent, but not vague. Its multivalence has a biological basis.

Thus, within the hypothesis of the Unified Matrix of the Universe, the fruit may be understood as a matrix of multiplicity. It transforms the singular unfolding of the flower into numerous new potential forms. It protects the seeds, organises their arrangement, creates internal boundaries, layers and chambers, and prepares them for maturation and dispersal. It contains future centres within a single whole and subsequently allows them to separate and begin their own cycles. Within it, stage D of the preceding process passes not into one new A, but into numerous new As.

The fruit is therefore not a passive receptacle, but an active morphogenetic structure. It Demonstrates how form, having unfolded, is enfolded once more—this time not into a single point, but into an organised multiplicity of seeds. The flower unfolded the internal towards the external; the fruit gathers the outcome of that unfolding within itself and prepares it for dispersal. The fruit is therefore a key biological model of the transition from a singular form to a multiplicity of future forms. The following section will examine how this multiplicity is distributed in space—radially, spirally, within chambers, across surfaces or by other means.

10.3. Spiral and Radial Distribution of Seeds

Having considered the fruit as a matrix of multiplicity, it is necessary to examine precisely how this multiplicity is organised in space. Seeds, primordia, fruit chambers, rosette elements, rows of seeds and plant modules are rarely arranged entirely at random. In many cases, they follow a particular order: radial, spiral, chambered, axial, superficial, cellular or combined. This order is particularly important to the hypothesis of the Unified Matrix of the Universe because it demonstrates that the biological reproduction of form involves not only the emergence of numerous new beginnings, but also their structured distribution.

The spiral and radial distribution of seeds is one of the most expressive biological manifestations of the Matrix. Here, the centre, axis, multiplicity, surface, rhythm, packing and potentiality are combined within a single form. Whereas the flower unfolded outwards through its petals, a seed-bearing structure often demonstrates how a multiplicity of future forms is organised around a centre or across the surface of a fruit. The seed becomes a distinct potentiality, but its position within the overall structure is not accidental. It is incorporated into the order of the multiplicity.

The best-known example of such organisation is the sunflower. Its seeds are arranged across the disc of the inflorescence in a dense system of intersecting spirals. Visually, this structure appears almost mathematical: numerous seeds form rhythmic rows extending in different directions, creating an impression of rotation, dense packing and centred growth. The sunflower is particularly important for morphological analysis because it reveals with exceptional clarity the relationship between the centre, multiplicity and the spiral organisation of a surface (*Fig. 7*).

The sunflower, however, should not be transformed into a mystical symbol of number or a universal secret of form. Its significance in this book is different. It demonstrates how a biological

system solves the problem of densely arranging numerous elements across a limited surface. The seeds must occupy space efficiently, without overlapping one another chaotically, while retaining their connection with the growth structure and the common centre. In this instance, spirality is not an ornament, but a means of organising multiplicity. It combines density, rhythm, growth and distribution.

The sunflower also demonstrates the distinction between radiality and spirality. Radiality implies directions extending from the centre towards the periphery. Spirality adds rotation and sequence to this arrangement. The seeds on the disc are not simply positioned along rays extending from the centre. They form curvilinear rows that appear to unfold around the central region. In this sense, a spiral is radiality incorporated into the temporal process of growth. It indicates not only where the elements are located, but also how the form may have progressively filled the available space.

This is fundamental to the hypothesis of the Matrix. Radial form makes the centre explicit, whereas spiral form reveals dynamics. The circle and radius express structure; the spiral expresses becoming. In the sunflower, the seeds do not merely form a geometric pattern; they record the biological history of the inflorescence's growth. Each seed occupies a place within a system in which the new emerges alongside what has already formed, while the entire surface is gradually filled. Spiral distribution may therefore be read as the trace of a process, rather than merely as a beautiful pattern.

Another important example is the lotus. In the lotus seed pod, the seeds are positioned in separate cells on the surface of a distinctive fruiting structure. Here, the organisation differs from that of the sunflower: it is less spiral than cellular, superficial and centred. Each seed occupies its own recess and its own place within the shared matrix of the fruit. The lotus demonstrates another principle of multiplicity: not dense spiral packing, but the distribution of separate potential beginnings across the surface of a common supporting structure (*Fig. 8*).

The seed-bearing structure of the lotus is particularly interesting because it makes multiplicity appear almost architectural. The surface of the fruit becomes a system of locules. Each locule contains a separate seed. Boundaries exist between the seeds, yet all of them belong to a single whole. This resembles the principle of internal faceting: the whole is divided into sections, each of which contains a potential beginning. The lotus structure demonstrates that a fruit may be not merely an outer covering, but a spatial organisation of multiplicity.

The lotus is also culturally significant, but the biological level of analysis must be maintained in this section. Its sacred and symbolic meanings in different traditions may be examined later; here, the primary concern is its morphology. The lotus demonstrates a centred fruiting structure in which the seeds are arranged in ordered cells. The symbolic significance of the lotus in numerous cultures is probably connected, at least in part, with its powerful morphological expressiveness: its centre, unfolding, clear surface, seeds and cellular multiplicity. Cultural meaning, however, must not replace biological structure.

The poppy capsule provides another form of seed Matrix. Within it, numerous small seeds are enclosed in a closed or semi-closed capsule. Its internal structure may include partitions, chambers, a central region, apertures or zones of opening. The poppy capsule demonstrates how a fruit can contain an enormous multiplicity of seeds within a compact form and subsequently release them gradually through specialised mechanisms. Here, the multiplicity is not displayed on the surface, as it is in the lotus or sunflower, but concealed within the capsule (*Fig. 9*).

The poppy capsule is particularly important to the themes of closure and dispersal. It is a fruiting form that contains numerous new beginnings without immediately releasing them. The seeds remain inside, protected and contained. As the capsule matures, it may release them through apertures or opening zones. Such a structure demonstrates that the fruit Matrix may simultaneously be closed, chambered and distributive. It retains the multiplicity until the moment of release.

The return to stage A at the level of multiplicity is particularly evident in the poppy capsule. A single closed fruit contains numerous small, enclosed potentialities. The capsule itself is a large closed structure, while the seeds within it are small closed structures. This creates a nested matrix: the outer covering of the fruit contains numerous seed coats. Such nestedness demonstrates how biological form may organise potentiality at several scales simultaneously.

Succulents and rosette-forming plants allow us to consider another aspect: the spiral-radial distribution not of seeds, but of plant elements. Although a succulent rosette is not a seed-bearing structure in the strict sense, it demonstrates the general principle of packing numerous modules around a centre. The leaves are arranged in layers, often according to a spiral logic, gradually progressing from the dense centre towards the open periphery. This structure is useful as a morphological analogue of the distribution of elements around a centre, but it must not be equated with a fruit or seeds (*Fig. 10*).

The succulent rosette is important because it demonstrates a sustained form of growth. In the sunflower, spirality is expressed in the seed-bearing disc; in the lotus, in the seed cells; in the poppy, in capsular multiplicity; and in the succulent, in the arrangement of leaf modules. All these structures differ in function, but each exhibits a centred organisation of multiplicity. Here, the Matrix manifests itself not as a single biological mechanism, but as the recurrence of a morphological task: arranging numerous elements in relation to a centre, axis, surface and periphery.

Spiral distribution is particularly important for understanding the temporality of form. A radial structure may be perceived as simultaneous: the centre and rays exist at once. A spiral structure almost invariably suggests sequence. It indicates that the elements emerged or were positioned in an order associated with growth, rotation, expansion and the filling of space. The spiral is therefore a morphological trace of time. It reveals how development is recorded in the arrangement of elements.

In biological structures, the spiral is often connected with efficient packing and growth. Numerous elements must be positioned across a limited surface or around a confined centre in such a way that they have sufficient space, access and connection with tissues without excessively obstructing one another. Spirality makes it possible to fill space progressively while maintaining rhythm and density. It should therefore not be understood solely as a symbol. It possesses both a structural and a functional basis.

Radial distribution, by contrast, emphasises the relationship between centre and periphery. In fruits, flowers, rosettes and seed-bearing structures, radiality demonstrates that numerous elements are organised around a common region. The centre may be visible or concealed, but it maintains the order. Radiality creates an even or approximately even distribution of elements around a circumference, across a surface or disc, or within a volume. It allows the multiplicity to be perceived as a whole.

In actual plant structures, radiality and spirality are frequently combined. The sunflower appears as a disc with an overall radial form, yet within it the seeds form spiral rows. A succulent rosette has a common centre and periphery, but its leaves may be arranged spirally. Some fruits have a radial cross-section, while the seeds within them may be arranged in rows or chambers. This demonstrates that the Matrix rarely operates through a single pure principle. It combines several principles: centre, radius, spiral, layer, module and edge.

This combination is particularly important for analysis. If one sees only radiality, the dynamics of growth may be overlooked. If one sees only spirality, the centred organisation may be lost. If one sees only the multiplicity of seeds, packing and boundaries may remain unnoticed. Morphological interpretation must therefore be based on multiple parameters. It must ask: Where is the centre? Where is the axis? Are there radial directions? Are there spiral rows? How are the seeds distributed? Are there chambers? How is the surface organised? Where is the edge? How does opening or dispersal occur?

The spiral and radial distribution of seeds also demonstrates the relationship between order and multiplicity. Multiplicity without order would be a chaotic collection of particles. Order without multiplicity would be a simple unified form. A seed-bearing structure combines both principles: numerous elements are organised into an ordered system. This makes fruiting and seed-bearing forms particularly important to the Matrix. They demonstrate how a unified morphogenetic process produces numerous potential future processes while retaining structural coherence.

The seeds within such structures are small units of the future. Each seed is potentially capable of becoming a new plant. Before their separation, however, they form a collective morphology. In the sunflower, the individual seed is part of the disc. In the lotus, it is part of the cellular surface. In the poppy capsule, it is part of the internal mass contained by the capsule. In each case, the seed is simultaneously individual and incorporated into the common matrix. This relationship between the individual and the collective is one of the principal biological manifestations of the Matrix.

The multiplicity of fruits and seeds is also connected with the concept of the module. The seed functions as a module of the future cycle. Numerous such modules are arranged within a fruit or inflorescence according to a particular pattern. Modularity enables a form to produce a large number of potential beginnings without losing its organisation. Each module resembles the others, but is not necessarily absolutely identical to them. Seeds may differ in size, position, degree of maturity and future fate. The seed-bearing structure therefore demonstrates variable modularity.

The modularity of seeds is particularly evident in the sunflower. Numerous seeds form a dense field, while each retains its individual form and position. In the lotus, modularity is expressed through separate cells. In the poppy capsule, it appears through numerous small seeds held within a common capsule. Modularity assumes different spatial forms in each instance. This demonstrates that the Matrix does not impose a single geometry, but permits different methods of organising multiplicity.

Spirality may also be understood as a means of avoiding the simple superimposition of elements. If numerous identical or similar elements must be positioned around a centre, straight radial rows may leave gaps or create intersections. Spiral distribution allows space to be filled more flexibly. In morphological terms, the spiral represents a compromise among the centre, growth, density and periphery. It makes the multiplicity stable and rhythmic.

Radiality, in turn, makes the whole legible. Even when the elements are arranged in a complex manner, the common centre allows the structure to be perceived as a unified form. The sunflower is perceived as a disc, the lotus pod as a centred surface, the succulent as a rosette and the poppy fruit as a closed capsule with an axial organisation. Radiality gives the form integrity, spirality gives it dynamism, and modularity gives it multiplicity. Together, they form the seed Matrix.

Seed distribution is also connected with the edge. In disc-shaped structures, the edge marks the limit of the arrangement of elements. In the sunflower, the seeds are positioned across the disc extending towards the outer zone. In fruits, the edge may be represented by the skin, a wall, a line of opening, the boundary of a chamber or an aperture. In the poppy capsule, the opening edge or apertures determine how the seeds will emerge. The cellular surface of the lotus has an external contour that contains its internal multiplicity. Here, the edge not only completes the form, but also participates in the release of future beginnings.

Structures in which the edge becomes a mechanism of dispersal are particularly important. A dry capsule may open along seams, valves, apertures or cracks. The seeds pass out through an edge, rupture or threshold. This repeats the general logic of morphogenesis: the boundary first contains and then opens. In the fruit, this logic operates at the level of multiplicity. A single outer covering opens a path for numerous seeds. The edge becomes a gateway for multiple new cycles.

The spiral and radial distribution of seeds is also connected with internal and external space. In the sunflower, the multiplicity is arranged across an open surface. In the lotus, it is contained in the cells of an open or semi-closed surface. In the poppy capsule, it occupies an enclosed volume. In some fruits, the seeds are located within chambers surrounded by flesh. In others, they occur on the surface or within dry structures. The seed Matrix may therefore be superficial, internal, chambered or mixed. This is important for its typology.

Superficial distribution makes the multiplicity visible. Internal distribution conceals it until the fruit is sectioned or opened. Chambered distribution divides the multiplicity into groups. Spiral distribution organises the multiplicity into a dynamic pattern. Radial distribution emphasises the centre. Linear distribution connects the seeds with an axis. These types may be combined. A fruit may, for example, possess internal radial chambers, with the seeds inside those chambers arranged in rows. The fruit Matrix is therefore often more complex than any single pattern.

Seed-bearing structures also demonstrate the relationship between packing and future dispersal. The arrangement of seeds within a fruit must be consistent with the way in which they will be released. If the seeds are to fall out through apertures, the internal structure must allow them to move. If the fruit opens through valves, the seeds must be positioned so that they can be released when it opens. If the fruit is eaten by animals, the seeds must be protected by outer coverings or adapted for transportation. Seed distribution is therefore connected not only with maturation, but also with the future trajectory of the seeds.

This demonstrates that the fruit Matrix organises not only internal space, but also a future trajectory. The word ‘organises’ does not, of course, imply a conscious design on the part of the plant. It refers to a biologically formed organisation that is functionally connected with dispersal. Morphologically, the fruit already contains the scenario of the seeds’ future release. Its form prepares for what will occur after ripening. The seed-bearing structure is therefore a form of future movement.

Spiral and radial structures will be particularly important for subsequent illustrative comparisons with cosmic and cultural structures, but their biological basis must be retained in this chapter. A sunflower may visually resemble a spiral galaxy or a mandala, but this does not imply that their mechanisms are identical. The sunflower involves the growth of plant tissue and the arrangement of seeds; the galaxy involves gravity, rotation, gas dynamics and stellar processes; the mandala involves cultural composition. The similarity may be morphological, but it is not causal.

For this reason, the sunflower, lotus, poppy capsule and succulent should be considered primarily as biological models of the organisation of multiplicity. Their significance lies in their capacity to reveal structural invariants: the centre, axis, repetition of modules, spiral or radial distribution, layering, edge, packing and future release. These features may subsequently be compared cautiously with other levels of the Matrix, but without conflating their mechanisms.

Seed distribution also helps us understand the relationship between form and number. The number of elements within such structures is significant, but should not be mystified. The number of seeds, rows, chambers or spirals is connected with biological development, the size of the fruit, the mode of growth, spatial constraints and function. Numerical regularities may be of interest for morphometry, but in the context of the present study, the organisation of multiplicity is more important than numerical symbolism. Here, number is an indicator of order, rather than an independent mystical code.

Nevertheless, numerical regularity may be useful for the future testing of the hypothesis. If seeds, petals, chambers, rows or spirals can be counted, measured and compared, morphological analysis acquires a quantitative foundation. It is possible to investigate angles of arrangement, packing density, the number of rows, the relationship between centre and periphery, and the character of the edge. Spiral and radial seed-bearing structures therefore provide suitable material for the transition from a visual hypothesis to morphometric analysis.

In this respect, the sunflower is particularly valuable because its structure readily lends itself to both visual and quantitative study. The number of spiral rows, seed density, variations in seed size from centre to periphery and the sequence in which the disc is filled can all be examined. The lotus permits an analysis of cellularity and the distribution of seeds across a surface. The poppy capsule enables the investigation of its internal capsular structure and mechanism of release. The succulent allows the arrangement of leaf modules within a rosette to be studied. All these Objects may serve not only as illustrations, but also as material for parametric description.

Seed-bearing structures also demonstrate the relationship between centre and multiplicity in its clearest form. The flower reveals its centre through its petals, whereas the fruit or seed-bearing field produces numerous new centres. In the sunflower, each element of the seed-bearing disc may be regarded as a potential centre of a future plant. In the lotus, each cell contains a separate seed. In the poppy capsule, numerous seeds are concealed within a single volume. A centred structure thus produces multiple centres. This is one of the key principles of the biological Matrix.

This transition from one centre to multiple centres has profound morphogenetic significance. The original plant was a single organism. The flower was a local centre of reproduction. The fruit became a matrix containing numerous seeds. Each seed may become a new centre of growth. The centre does not therefore disappear, but multiplies. Biological reproduction may be described as the dissemination of centred organisation into the environment. This is not a metaphor, but a morphological description: numerous seeds may indeed become numerous new centres of development.

The spiral and radial distribution of seeds also demonstrates that future multiplicity is initially contained within an order and subsequently released into the uncertainty of the environment. While the seeds remain on the disc, within cells or inside a capsule, their positions are organised. Once dispersed, they are scattered. Some enter favourable conditions, while others do not. The order of the fruit passes into the probability of the environment. A new order of the plant then emerges from some of the seeds. The cycle of the Matrix thus includes a transition from order to dispersal and from dispersal to renewed order.

This is particularly important for understanding the openness of the biological cycle. The Matrix does not completely control the fate of every seed. It organises the production and initial distribution of potentialities, but their subsequent realisation depends upon the environment. Spiral and radial structures are therefore not guarantees of the future, but means of creating possibilities in an ordered manner. The fruit and seed-bearing field create potential, but do not determine its ultimate realisation.

In this sense, the seed Matrix is a model of a probabilistic future. It creates numerous potential beginnings, but does not determine which of them will become plants. Here, biological order is combined with uncertainty. This makes fruiting and seed-bearing structures particularly important to the philosophy of form. Form does not merely unfold itself; it produces possibilities that may or may not be realised. The Matrix is not only an order, but also a source of an open future.

Seed distribution is also connected with the concept of density. In some structures, the seeds are arranged extremely densely, almost without gaps. In others, they are more widely spaced. Density reflects the use of space, seed size, the functions of the fruit and its mode of dispersal. In the sunflower, the density of the seed-bearing disc creates a powerful impression of a continuous field. In the lotus, the cells are separated, and the multiplicity is perceived as a system of individual locules. In the poppy capsule, the multiplicity is concealed within. Different densities create different types of Matrix.

Density also affects the perception of form. A densely organised multiplicity may be perceived as a unified surface. A dispersed multiplicity appears as a set of individual elements. A chambered multiplicity resembles an internal architecture. A spiral multiplicity appears as a dynamic pattern. A radial multiplicity appears as a centred field. These distinctions are important to morphological description because they demonstrate how form governs the relationship between part and whole.

Spiral distribution demonstrates particularly clearly that part and whole remain in constant relation to one another. An individual seed possesses its own form and future potential, yet its position is determined by the structure of the whole. The whole, in turn, exists as an organised multiplicity of seeds. The disc of a sunflower cannot be understood if the individual seeds are disregarded, and the position of a seed cannot be understood without reference to the disc. This relationship between part and whole is one of the fundamental principles of the Matrix.

The lotus seed structure demonstrates the same principle in a different way. Each seed occupies its own cell, while the cells together form a unified surface. Individuality is expressed more strongly here than in the sunflower. The lotus may therefore be regarded as a model of cellular multiplicity. The poppy capsule, by contrast, demonstrates an internally concealed multiplicity in which the individual seeds are less visible before the capsule opens. The succulent rosette demonstrates the modular multiplicity of leaves around a centre. These differences create a rich typology.

It is important to emphasise that spirality and radiality are not the only modes of distribution. They are highlighted because they are particularly expressive and can readily be compared with the general logic of the Matrix. Fruiting structures, however, may be linear, reticular, chambered, irregular, asymmetrical, superficial or three-dimensional. The Matrix cannot be reduced to the spiral and circle. Spirality and radiality are important, but they are not the only morphogenetic invariants.

This qualification protects the hypothesis from oversimplification. If one searches only for spirals, the material may be forced artificially into a predetermined pattern. It is far more productive to analyse different types of organisation of multiplicity. The spiral demonstrates dynamic distribution around a centre. Radiality demonstrates centred distribution. Chambered organisation represents internal segmentation. Cellularity represents local packing. Linearity represents axial sequence. All these types may be forms of the Matrix if they are connected with processes of reproduction and distribution.

Seed-bearing structures also allow us to introduce the concept of biological geometry. This geometry is not imposed externally. It arises from growth, division, the arrangement of tissues, spatial constraints, the function of dispersal and hereditary organisation. Biological geometry is therefore always processual. The sunflower does not draw a spiral as an ornament; the spiral arises through the organisation of growth. The lotus does not construct cells as an architectural object; the cells form as part of the fruiting structure. The poppy does not create a capsule for the sake of symmetry; the capsule contains and disperses the seeds. Geometry here is a trace of life.

This is particularly important for the Matrix. If the geometry of form emerges from a process, its analysis must take that process into account. It is not sufficient merely to say, ‘there is a spiral here, and therefore a Matrix’. One must ask: What function does this spiral perform? How is it connected with growth? How are the elements arranged? What does it do for the fruit or seeds? How does it participate in the cycle? Only after these questions have been answered does the spiral become a morphogenetic feature rather than a decorative association.

Spiral and radial distribution also helps us understand the connection between living form and the optimisation of space. Many plant structures arrange their elements in ways that enable the available surface or volume to be used efficiently. This does not imply conscious optimisation, but it does mean that forms functionally suited to arrangement, nourishment, opening or dispersal become established through evolution and development. The packing of seeds is one such instance. Here, the Matrix manifests itself as the structural rationality of living form.

The rationality of living form should not be understood as intention. A plant does not plan its geometry. The outcome, however, may be structurally expedient. Spiral rows, radial chambers, dense packing, cellular structures and lines of opening solve particular problems. It is therefore possible to speak of morphological expediency without introducing a conscious subject. This preserves scientific rigour and allows the concept of the Matrix to be used without teleological exaggeration.

Seed-bearing structures also demonstrate that biological reproduction possesses an aesthetic of its own. A sunflower disc, lotus seed pod, poppy capsule or succulent rosette may be perceived as beautiful precisely because the order of multiplicity is visible within it. Yet the aesthetic aspect is once again secondary. It arises from organised distribution, density, rhythm, repetition and the centre. The beauty of a seed-bearing structure is the visible expression of its morphogenetic organisation.

The illustrations for this section should show different types of distribution: the sunflower, to demonstrate the dense spiral organisation of seeds across a disc (*Fig. 7*); the lotus, to demonstrate the cellular arrangement of seeds across a fruiting surface (*Fig. 8*); the poppy capsule, to demonstrate the capsular form of concealed multiplicity and the subsequent release of seeds (*Fig. 9*); and the succulent rosette, to demonstrate the spiral-radial distribution of leaf modules around a centre as a comparative plant model of packing (*Fig. 10*).

A comparative diagram may also be used in which these four structures are presented alongside one another as different types of biological Matrix of multiplicity: the disc-shaped spiral, the cellular surface, the closed capsule and rosette modularity (*Fig. 11*). Such a diagram would demonstrate that the Matrix does not possess a single external form. It manifests itself through different spatial solutions to a common task: organising numerous potential or modular elements around a centre or axis, across a surface, or within a volume.

An important conclusion of this section is that seed multiplicity always possesses a spatial form. New beginnings do not arise in abstraction. They must be positioned, protected, brought to maturity and released into the environment. Biological reproduction therefore requires morphology. The fruit, disc, capsule, rosette, chamber, cell, spiral, row and edge are all elements in the architecture of the future. Seeds are potential forms, but their potential is initially organised by another form.

This allows us to understand more deeply the relationship between fruit and seed. The seed is an individual bearer of the future cycle. The fruit or seed-bearing structure is a collective organisation of such bearers. The fruit is responsible for multiplicity, while the seed embodies individual potentiality. Together, they form the biological system through which form is reproduced. Within the Matrix, this corresponds to the transition from a single open centre to numerous new closed centres.

Thus, the spiral and radial distribution of seeds within biological structures demonstrates that the multiplicity of future forms is organised not chaotically, but through particular morphogenetic principles. The sunflower demonstrates dense spiral packing across a disc; the lotus, a cellular and centred surface; the poppy capsule, an enclosed capsular multiplicity; and succulents, a modular rosette organisation around a centre. These structures differ in function, but each demonstrates how the Matrix connects the centre, multiplicity, surface, edge, packing and the future cycle.

The seed-bearing structure is therefore not merely the outcome of flowering, but also the spatial organisation of the future. Radiality connects multiplicity with the centre; spirality reveals the dynamics of growth and packing; cellularity distinguishes individual potentialities; capsular organisation contains concealed multiplicity; and the edge prepares for the release of seeds into the environment. Through these forms, biological reproduction becomes visible as a morphogenetic order. The following section will connect this order with the universal A–B–C–D model and present biological reproduction as a complete cycle of form.

10.4. Biological Reproduction as a Morphogenetic Cycle

Biological reproduction is one of the clearest levels at which the A–B–C–D model may be considered as a complete morphogenetic cycle. The seed, germinating seed, plant, bud, flower,

fruit and new seed successively manifest all the principal stages of the Matrix: closed potentiality, initial opening, multilayered complexification, the full manifestation of form and the return to a new potentiality. Biological material is therefore of particular importance to the hypothesis of the Unified Matrix of the Universe: here, the cycle of form is not merely a philosophical scheme, but is represented as a real process of life.

The seed corresponds to stage A. It is a closed structure in which the future form exists in a compressed, protected and potential state. Externally, the seed may be small and relatively simple, but it contains the possibility of a future plant. It carries the memory of the preceding cycle while simultaneously opening the way to the next. Stage A in biological reproduction is therefore not an absolute beginning from nothing. It is a beginning that follows the completion of a previous process. The seed is already the outcome of flowering, fruiting and the transmission of form.

Germination corresponds to stage B. At this moment, the seed ceases to be completely closed. Its outer covering is ruptured, the radicle and subsequently the shoot emerge, and the first axis of the future plant appears. The internal passes into the external for the first time. Germination is a biologically precise example of initial opening: the form is not yet complete and the plant has not yet become a complex structure, but the direction of development has already been established. Stage B demonstrates how potentiality passes into action.

The growth of the plant and the formation of its root system, stem, leaves, branches, buds and flower buds correspond to stage C. Here, the form becomes more complex, creating layers, levels, branches, surfaces, edges, and internal and external systems of distribution. The plant ceases to be merely the axis of a shoot and becomes a multilayered organism. It unfolds its roots within the soil, its stem vertically, its leaves into the space of light, its branches towards the periphery, and its vascular networks within its tissues. Stage C is the phase of active differentiation and complexification of biological form.

Flowering and fruiting correspond to stage D and the transition to a new A. The open flower represents a moment of pronounced manifestation of form: the centre is exposed, the petals are unfolded, the radial or other floral organisation is visible, the edge is active, and colour and lines of growth participate in interaction with the environment. Yet the flower is not a final destination. Its unfolding is connected with the reproductive process that leads to the fruit and seeds. The fruit contains numerous future beginnings, while the seed returns form once again to a state of closed potentiality. In this way, D passes into a new A.

Biological reproduction demonstrates with particular clarity that the A–B–C–D model is not a straight line, but a cycle. The seed becomes a shoot, the shoot becomes a plant, the plant becomes a flowering and fruiting form, the fruit becomes the bearer of new seeds, and the seeds become the beginnings of new plants. This cycle, however, is not a mechanical repetition of the same thing. Each new seed enters a different environment, encounters its own conditions of development and may produce an individual form. The biological cycle is therefore spiral: it returns to the seed, but not to precisely the same state.

The formula of the biological cycle may be represented as follows: seed—germination—growth—branching—flowering—fruit—new seed. Translated into the language of the A–B–C–D model, it becomes: A—the closed seed; B—the initial opening and emergence of the axis; C—the multilayered development of the plant; D—the unfolded reproductive form; and a new A—the seed of the subsequent cycle. This scheme does not replace botanical description, but makes it possible to identify a morphogenetic logic shared by different plant processes.

It is particularly important that this scheme is repeated within the plant more than once and not only at the level of the organism as a whole. The seed produces a plant, but new local cycles arise within that plant: the bud as the closed form of a future shoot, the flower bud as the closed form of a future flower, and the fruit as the closed form of numerous seeds. Each of these objects may be regarded as a local stage A within the larger stage C or D of the plant. This demonstrates the nested character of the biological Matrix.

A vegetative bud contains a future shoot or leaf. A flower bud contains a future flower. A fruit contains future seeds. A seed contains a future organism. These structures differ in function and scale, but they are united by a single morphogenetic principle: the future form is temporarily contained within a closed state, after which it begins to open, becomes more complex, reaches manifestation and creates the possibility of a new cycle. Biological reproduction thus proves to be a system of nested cycles rather than a single simple sequence.

This nestedness is particularly evident in the relationship ‘plant—flower—fruit—seed’. The plant as a whole is an unfolded form that arose from a seed. The flower is a local unfolded form within the plant. The fruit is the outcome of the floral cycle and simultaneously a matrix of seeds. The seed is a small closed beginning of a future plant. What constitutes a part at one level therefore becomes the centre of a future whole at another. This is one of the most important biological principles of the Matrix.

Biological reproduction also demonstrates the transition from the singular to the multiple. One seed may produce one plant. One plant may produce numerous flowers. A flower or inflorescence may produce a fruit or numerous fruits. A fruit may contain numerous seeds. Each seed may become a new beginning. The cycle of form therefore does not merely close; it branches. Reproduction is not only a return to the beginning, but also a multiplication of potential beginnings.

This multiplication makes the biological Matrix generative. It does not merely preserve form, but creates a field of future possibilities. A multiplicity of seeds does not guarantee that every seed will become a plant. It does, however, expand the space of the future. Biological form produces an excess of potentiality, from which the environment and prevailing conditions select the trajectories that will be realised. Reproduction therefore combines order and probability: order creates the seeds, while probability determines their subsequent fate.

In this sense, the biological cycle cannot be understood as entirely predetermined. The seed contains potential, but germination depends upon conditions. The shoot possesses an axis, but its development depends upon light, water, soil, temperature, damage, competition and numerous other factors. The plant has a characteristic structure, but the particular form of its branches, leaves, flowers and fruits is individual. The A–B–C–D model therefore describes not a rigid programme, but a typical trajectory of morphogenesis realised within a specific environment.

It is here that the crucial distinction between the Matrix and a blueprint becomes apparent. A blueprint presupposes the precise reproduction of a predetermined form. The Matrix, in the biological sense, establishes an organisational principle while allowing scope for variation, environmental influence, adaptation and chance. A seed does not contain a complete tree as a miniature copy. It contains the possibility of a tree of a particular type. The actual tree will result from the interaction of that possibility with the world. Biological reproduction is therefore a process of open-ended unfolding rather than mechanical repetition.

The reproductive cycle also demonstrates the relationship between memory and novelty. The seed carries the memory of the preceding cycle: hereditary, morphological, material and species-specific. Yet the new plant is not a mere duplicate of the previous one. It unfolds this memory under new conditions. In this sense, the biological Matrix operates as memory open to the future. It preserves the invariant without eliminating variation. This is particularly important for understanding the spiral nature of the cycle.

The spiral nature of biological reproduction is manifested in the fact that each new cycle resembles the preceding one in its general pattern, while differing in its specific realisation. The seed germinates again, an axis emerges again, and leaves, flowers and fruits appear again. Yet the plant may be taller or shorter, stronger or weaker, with a different number of branches, leaves, flowers and fruits, and with a different history of interaction with its environment. What is repeated is therefore not the external outcome, but the morphogenetic pathway.

In this sense, biological reproduction is one of the clearest examples of the reproduction of an invariant through variation. The invariant is the sequence of closure, opening, growth, branching, flowering, fruiting and the formation of a new seed. The variation lies in the particular form of each plant, leaf, flower and fruit. The Matrix does not eliminate differences; it provides them with a common structural framework. Life manifests a universal principle through individual forms.

The biological cycle also demonstrates that complete unfolding is not always the most important moment from the perspective of continuation. The open flower is a vivid and aesthetically expressive stage, but biological reproduction requires the transition to the fruit and seed. The fruit may appear less striking than the flower, yet it is the fruit that contains the outcome of the reproductive process. The seed may be even less conspicuous externally, yet it is the seed that opens a new cycle. The Matrix therefore teaches us to attend not only to the culmination of manifestation, but also to the concealed forms of transmission.

This point is particularly important to the philosophy of form. Visible unfolding often attracts more attention than closed potentiality. The flower is perceived as the culmination of the plant. From the perspective of the cycle, however, this culmination is inseparable from the return to the seed. Biological reproduction therefore demonstrates that form has two culminations: the culmination of manifestation and the culmination of transmission. The flower is the culmination of manifestation; the seed is the culmination of transmission. The fruit connects them.

Within this cycle, the fruit plays the role of an intermediate Matrix. It gathers the outcome of flowering, organises numerous seeds, protects them and prepares them for dispersal. It demonstrates that the D → A transition may be complex, multistage and multiple. A completed form does not always become a new seed immediately; between unfolding and a new beginning, a special structure of storage, maturation and distribution may arise. The fruit is precisely such a structure.

Biological reproduction also makes visible the transition from one centre to multiple centres. The flower possesses a centre. The fruit may contain numerous seeds. Each seed is a potential centre of a future plant. A single centre of unfolding therefore passes into numerous future centres of growth. This is one of the most profound features of the biological Matrix: the centre is not merely preserved, but multiplied. Form transmits the capacity for centred organisation to numerous new points.

This transition is particularly evident in the seed-bearing structures of the sunflower, lotus, poppy and other plants. In the sunflower, numerous seeds are organised across a disc around a centre.

In the lotus, seeds are positioned within the cells of the fruiting structure. In the poppy capsule, numerous seeds are concealed within the capsule and subsequently released. In each case, a unified process of plant development creates numerous potential new centres. Seed distribution is a spatial image of future multiplicity.

The biological cycle also demonstrates the role of the edge. At the seed stage, the edge is an outer covering. During germination, that covering becomes a threshold. In the leaf, the edge becomes the active periphery of exchange. In the petal, the edge becomes the visible boundary of unfolding. In the fruit, the edge, skin, valve, aperture or line of rupture becomes a mechanism for containing and releasing the seeds. At each stage, the edge changes its function: it protects, opens, interacts and disperses. Biological reproduction is therefore a cycle of the transformation of boundaries.

The layer likewise extends throughout the biological cycle. The seed possesses outer coverings and internal structures. Tissues emerge in the shoot. The leaf possesses layers and veins. The flower bud contains layers of petals. The flower possesses rows of petals and a centre. The fruit contains skin, flesh, chambers, partitions and seed coats. Layers are not secondary details; they provide protection, nourishment, differentiation, unfolding and transmission. The biological cycle demonstrates that form develops through the continuous formation and transformation of layers.

The axis also extends throughout the entire cycle. A primary root–shoot axis emerges in the germinating seed. In the plant, it becomes the stem, the direction of growth and a system of branching. In the leaf, the axis is expressed through the midrib. In the flower, a concealed axis connects the centre with the stem. In the fruit, the axis may persist as a line of attachment, an internal structure or the direction in which the seeds are arranged. In the new seed, the axis is once again enfolded into a potential state. Biological reproduction may therefore be interpreted as a cycle in which the axis is manifested, distributed and enfolded anew.

Branching is likewise not an isolated episode, but a fundamental mechanism of the biological Matrix. Roots branch within the soil, stems produce shoots, leaves possess networks of veins, floral structures may form branched inflorescences, and fruiting structures may produce numerous seeds. Branching transforms a single direction into multiple directions. It creates area, volume, networks, distribution and the possibility of a multiple future. Biological reproduction is therefore not only a cycle, but also a branching system of cycles.

The fractality of the biological cycle is manifested precisely in this nestedness and branching. One plant contains numerous local cycles. One flower may produce numerous seeds. Each seed may begin a new organism that will once again produce leaves, flowers, fruits and seeds. At different levels, the same relationships recur: centre—axis—branching—surface—edge—new beginning. This is not strict mathematical fractality, but the biological self-similarity of processes and functions.

Such self-similarity must not be absolutised. A plant is not an infinitely repeating geometric form. Biological cycles are finite and constrained by species, environment, time, resources, heredity and chance events. Yet the recurrence of principles is genuinely observable: closed potentiality, unfolding, axial organisation, branching, layering, the edge and reproduction. It is this recurrence that makes the biological level particularly important to the hypothesis of the Matrix.

Biological reproduction also demonstrates that a new form arises through separation and dispersal. The seed must leave the fruit or detach from the maternal structure. It may fall or be

transported by wind, water, animals, human beings, mechanical ejection or some other means. While the seed remains connected with the fruit, it is part of the old cycle. Once it separates, it gains the possibility of beginning its own cycle. Here, separation is not a rupture of meaning, but a condition of independence.

This separation reflects a more general principle: a part can become a whole only after leaving the structure to which it previously belonged. A bud becomes a shoot, a flower bud becomes a flower, and a seed becomes a plant. Yet this emergence does not destroy continuity. The seed separates from the parent plant, but carries its principle. The new plant is not the previous plant, yet it remains connected with it. Biological reproduction therefore combines rupture with connection, independence with inheritance, and a new beginning with memory.

In this sense, the biological cycle is a model of continuity without identity. Form continues, but is not copied literally. The previous organism does not persist as the same object, but its morphogenetic principle is transmitted. The new plant is not the old plant, but belongs to the same lineage of life. This logic is important to the hypothesis of the Matrix because it demonstrates how a universal principle may persist through changing forms.

Biological reproduction is also connected with decay and transformation. The flower withers, the fruit ripens and may decompose, the seed coat ruptures during germination, the old plant may die, and leaves fall. These processes are not an external negation of life. Within the cycle, they may be conditions of continuation. The withering of the flower is connected with the transition to the fruit. The breakdown of the fruit may facilitate the release of seeds. The rupture of the seed coat is necessary for the emergence of the shoot. The biological Matrix therefore includes not only growth and beauty, but also decay, opening, rupture and transformation.

This is important for a mature understanding of morphogenesis. Form does not develop solely through harmonious unfolding. It develops through thresholds, disruptions of outer coverings, separation and the destruction of former boundaries. Germination is impossible without overcoming the seed coat. Seed dispersal is often impossible without the opening of the fruit. A new plant cannot emerge unless the seed passes from dormancy into active development. Rupture within the biological cycle may therefore be productive.

Biological reproduction also demonstrates that the Matrix is not merely the form of a single organism. It operates at the levels of the organ, organism, generation and environment. The flower is a local Matrix. The fruit is a matrix of seed multiplicity. The seed is a matrix of the future organism. A plant population is a network of numerous cycles. The ecosystem is the environment in which these cycles are realised or interrupted. The biological level of the Matrix therefore encompasses multiple scales.

This chapter has focused primarily on the seed, fruit and seed-bearing structures. Behind them, however, lies a broader system: the plant produces forms; those forms produce new beginnings; the new beginnings enter the environment; the environment selects and sustains some of them; and the new plants continue the process. Biological reproduction is not a closed scheme contained within a single object, but an open cycle incorporated into the world. This once again demonstrates that the Matrix is realised only through interaction.

The A–B–C–D scheme helps to organise this complex process. It does not replace biology, but identifies a general morphogenetic sequence. In biological reproduction, this sequence may be expressed as follows: A—the seed as closed potentiality; B—germination as the first emergence; C—growth, branching and the formation of organs; D—flowering and fruiting as the full

manifestation of reproductive form; and a new A—the seeds of the next generation. This scheme makes visible the transition from one form to another through the cycle.

The scheme must, however, remain flexible. Different plants possess different life cycles, fruit forms, dispersal mechanisms, and structures of seeds and flowers. Not every plant will correspond perfectly to a single simple model. Some plants have inconspicuous flowers, others possess complex fruits, still others disperse their seeds through specialised mechanisms, while in some plants vegetative reproduction plays a major role. The A–B–C–D model must therefore not become a universal botanical formula. It is a morphological framework that must be applied with due regard for the specific biology of each case.

This qualification is especially important for scientific accuracy. Biological reproduction is diverse. Reproduction by seed is not the only form of plant reproduction. This chapter focuses specifically on seed-bearing structures, fruits and the cycle seed—plant—flower—fruit—seed because it demonstrates the Matrix model with particular clarity. Other forms of biological reproduction may be examined separately and will require their own qualifications.

Within this chapter, the seed cycle has particular value as a clear and accessible model. It demonstrates that form may be preserved through a compact bearer, unfold through an axis, become more complex through branching, attain manifestation through the flower, multiply future beginnings through the fruit and return to the seed. This cycle combines almost all the principal concepts of the study: potentiality, centre, axis, layer, edge, fold, unfolding, multiplicity, fractality, memory and the new cycle.

Biological reproduction also provides a basis for subsequent comparisons with other levels of the Matrix. Geology contains no seed in the biological sense, but it does contain cycles of accumulation, pressure, opening, destruction and renewed sedimentation. The cosmos contains no fruit in the biological sense, but it does contain processes involving the concentration of matter, structuring, dispersal and incorporation into new forms. Culture contains no biological germination, but it does possess symbols, texts and artefacts that preserve and transmit semantic invariants. The biological cycle serves as a model for cautious comparative analysis, but must not be transferred literally.

This is why the chapter on seed-bearing structures is important to the study as a whole. It presents the most rigorous and materially explicit version of the cycle: a seed genuinely germinates, a plant genuinely develops, a flower genuinely opens, a fruit genuinely contains seeds, and seeds may genuinely begin a new cycle. At this level, the hypothesis acquires a strong biological foundation. In moving to other levels, it will be necessary in every instance to distinguish between a direct biological process and a morphological analogy.

In illustrative terms, the conclusion of the chapter may be represented by a diagram of the complete biological cycle: seed—germination—shoot—plant—bud—flower—fruit—seeds—new germination (*Fig. 12*). This diagram should be analytical rather than decorative. The stages A, B, C, D and the new A may be indicated within it. Such an illustration would demonstrate that the A–B–C–D model functions not as an abstract sequence, but as a biologically legible cycle.

Another useful illustration could present a diagram of nested cycles: the plant as a large cycle, the bud as the local A of the flower, the fruit as a matrix containing numerous new As, and the seeds as the future centres of new plants (*Fig. 13*). Such a diagram would demonstrate that biological reproduction is not a single line. It includes numerous internal and subsidiary cycles.

This is particularly important for understanding the fractal and networked nature of the living Matrix.

A comparative table of stages may also be used:

- A — seed / bud / young fruiting structure;
- B — germination / beginning of the bud's opening / beginning of maturation;
- C — plant growth / unfolding of the petals / formation of the fruit and seed chambers;
- D — flowering / ripe fruit / readiness for dispersal;
- new A — seeds of the subsequent cycle (*Fig. 14*).

Such a table would demonstrate that the same scheme may be applied to different nested levels of biological form.

Thus, biological reproduction is a morphogenetic cycle in which form does not simply arise and disappear, but preserves, unfolds, complexifies and transmits its organising principle. The seed is closed memory and a future beginning; germination is the first opening; plant growth is multilayered complexification; the flower is manifested form; the fruit is a matrix of multiplicity; and the new seeds represent a return to potentiality. The biological cycle thus renders the A–B–C–D model concrete, observable and internally coherent.

The chapter on seed-bearing structures, fruits and the reproduction of form therefore completes an important stage in the analysis of the biological level of the Matrix. The flower demonstrated the unfolding of form; the petal, the transformation of a layer into an element; the veins, the internal architecture of flows; the seed, both beginning and outcome; the fruit, the multiplicity of future beginnings; and seed-bearing structures, the spatial order of that multiplicity. Together, they form a biological model of cyclical morphogenesis: the closed becomes open, the open becomes complex, the complex becomes mature, and the mature is enfolded once again into a new multiplicity of potential beginnings.

Fig. 1. Closed Seed as a Compact Form of Potentiality and Protected Morphogenetic Memory

Fig. 2. Germinating Seed: Rupture of the Seed Coat and Transition from Stage A to the First Opening of B

Fig. 3. Sequence “Flower — Fruit — Seed — Sprout” as a Scheme of the Seed that Both Completes and Opens the Cycle

Fig. 4. Section of a Multi-Seeded Fruit: Internal Organisation of Seeds, Chambers, Septa, and Axial Structure

Fig. 5. Radial or Star-Shaped Structure of a Fruit in Section as an Example of the Hidden Geometry of Multiplicity

Fig. 6. Opening Fruit or Seed Capsule: Transition from Seed Retention to Seed Dispersal

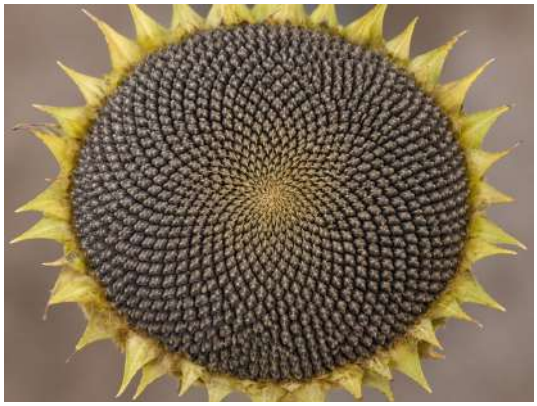

Fig. 7. Sunflower: Spiral Distribution of Seeds on a Disc Surface around the Centre

Fig. 8. Lotus Seed Pod: Cellular Arrangement of Seeds within a Unified Fruit Structure

Fig. 9. Poppy Capsule: Closed Capsular Matrix of Hidden Multiplicity and Seed Release

Fig. 10. Succulent Rosette: Spiral-Radial Distribution of Plant Modules around the Centre

Fig. 11. Comparative Diagram of Biological Structures of Multiplicity: Disc Spiral, Cellular Surface, Closed Capsule, and Rosette Modularity

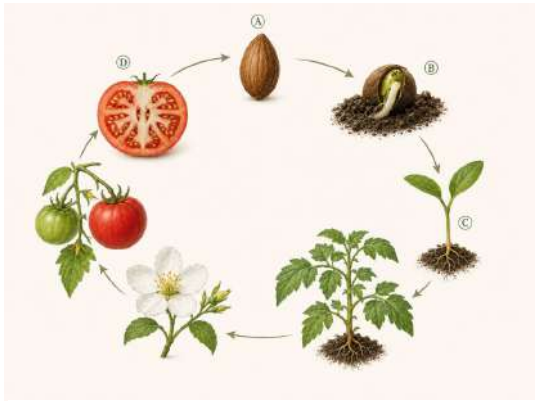

Fig. 12. Complete Biological A–B–C–D Cycle: Seed — Germination — Growth — Flowering — Fruit — New Seed

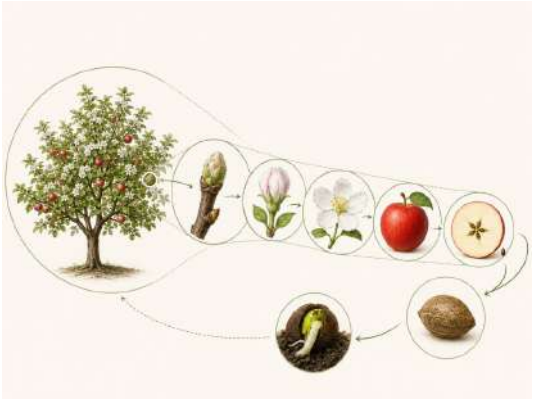

Fig. 13. Nested Biological Cycles: Plant, Bud, Flower, Fruit, and Seeds as Local Matrices at Different Scales

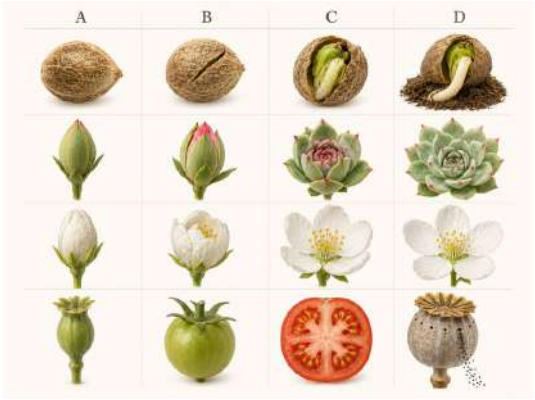

Fig. 14. Comparative Diagram of A–B–C–D Stages at the Levels of the Seed, Bud, Flower, and Fruit

Chapter Eleven

The Leaf, Fern, Succulent and Fractal Botany

11.1. The Leaf as a Plane of Unfolding

The leaf is one of the clearest plant forms through which the principle of the Matrix's unfolding in biological space may be understood. Whereas the seed demonstrates closed potentiality, the bud a compressed floral form, and the flower radial unfolding around a centre, the leaf demonstrates another type of morphogenesis: unfolding into a plane. Its central vein, lateral branches, area of growth, surface of exchange and active edge are expressed with particular clarity. The leaf may therefore be regarded as a local model of the planar unfolding of form.

The leaf is not simply a green plate. Its surface is organised by an internal architecture. The central vein establishes the principal direction; the lateral veins distribute the structure across the area; smaller branches create a network; and the edge completes the form at its point of contact with the environment. In this sense, the leaf is not a plane in a geometrically empty sense, but a living surface permeated by lines of distribution, support, growth and exchange. It demonstrates that an unfolded form always possesses an internal order.

The central vein of the leaf performs the role of an axis. It connects the base of the leaf with its apex, maintains the direction of growth and organises the lateral regions. Through it, the leaf acquires its principal structural orientation. If the leaf is considered as a biological Matrix, the central vein is the element that transforms the concealed potentiality of the bud or young leaf primordium into an unfolded surface. Without this axial line, the leaf blade would lose its morphological centre of direction.

The central vein, however, is not a centre in the same sense as the centre of a flower. A flower is often organised radially around a central region. A leaf, by contrast, is usually structured as an axial form: from base to apex, from the principal line to the lateral branches, and from the middle towards the edges. The leaf therefore demonstrates axial-planar rather than radial unfolding. It is particularly important for understanding that the Matrix cannot be reduced to the circle or to floral radiality. It may also manifest itself as a directed plane.

The lateral veins reveal the principle of transition from one direction to many. The central vein is the principal axis, but the leaf does not remain a single line. Lateral branches extend from it, distributing the structure across the entire area. These branches may be pinnate, arcuate, palmate, parallel, reticulate or combined. In each case, the leaf solves the same morphogenetic task: connecting its base, axis, surface and edge within a unified system.

It is the lateral veins that make the leaf a model of unfolding. They demonstrate how an area arises from a principal line. The axis alone does not yet create a leaf. The leaf emerges when the direction begins to extend laterally, when a lateral network appears, when the spaces between the lines are filled with tissue, and when the surface becomes active. The leaf may therefore be

understood as a form in which a line becomes a plane and the plane becomes a system of exchange.

The area of the leaf possesses significance in its own right. It is not a passive space between the veins. On the contrary, it is the area of the leaf blade that performs crucial biological work: receiving light and participating in gas exchange, transpiration, photosynthesis and interaction with air, moisture and temperature. The leaf surface is an open zone of contact between the plant and its environment. The leaf as a plane of unfolding is therefore not merely a form, but a functional surface.

Within the hypothesis of the Unified Matrix of the Universe, this has fundamental significance. The unfolding of form should not be understood merely as an external spreading-out. The leaf unfolds not for the sake of geometric beauty, but in order to participate in vital exchange. Its area is an area of action. The more fully the surface is unfolded, the more actively the leaf can interact with light and air. The morphogenesis of the leaf is therefore connected with function: the form unfolds because unfolding is necessary for the life of the plant.

The edge of the leaf completes the plane of unfolding. It may be smooth, serrated, undulating, lobed, dissected, entire or compound. The edge indicates the limit of growth, but this limit is not a passive line. It records the interaction between the leaf's internal architecture and the external environment. Serrations may correspond to the endings of veins, undulations to uneven tissue growth, lobes to a pronounced differentiation of the surface, and dissection to a particular strategy for distributing area. The leaf edge is therefore one of the most important features of its morphogenesis.

In the preceding chapters, the edge was considered as an active periphery. The leaf confirms this proposition at the biological level. Its edge does not merely delimit the surface, but demonstrates how the internal network reaches the external world. The central vein and lateral branches form the structure, the area of the leaf receives and processes environmental influences, and the edge becomes a zone of completion and contact. The leaf demonstrates particularly clearly that the edge is not the termination of form, but the site of its interaction.

A young leaf does not usually emerge immediately as a fully unfolded plane. It may be folded, rolled, twisted, compressed, concealed within a bud or protected by other structures. As it grows, it unfolds, spreads out its blade, reveals its veins, increases its area and forms its edge. The leaf therefore also progresses from a closed or semi-closed state towards complete manifestation. Its morphogenesis may be described through the A–B–C–D model: A—the leaf primordium or bud; B—the initial emergence of the axis and the leaf itself; C—the expansion of the blade and development of the venation network; D—the mature, fully unfolded leaf.

Such a description should not replace the botanical understanding of leaf development, but it helps reveal its morphogenetic logic. The mature leaf is the result of a successive unfolding. It retains traces of its former folded state: curves, folds, the direction of its veins, the form of its edge and, at times, asymmetry of the surface. Even a fully unfolded leaf carries the memory of its growth. Its plane is not an abstract geometry, but a history of unfolding recorded in tissue.

The fold plays a particular role in leaf development. The young leaves of many plants unfold from a folded or rolled state. Folds allow a large future surface to be temporarily accommodated within a small volume. As the leaf grows, the fold opens, the area increases, the edge moves away from the centre or axis, and the veins become more visible. In this respect, the leaf provides direct

biological confirmation of the proposition that an unfolded form often emerges from an enfolded form.

The leaf also demonstrates the connection between the fold and the vein. The central vein may constitute the line along which the young leaf was folded. The lateral veins may establish directions of expansion. Undulations of the surface or edge may be traces of uneven unfolding. Geometry cannot therefore be separated from the mechanics of growth within the leaf. Its form arises through tissue tension, expansion of the surface, support from the veins, water balance, turgor and interaction with external conditions.

Leaf veins are not merely lines within the visible structure, but channels of distribution. They are associated with the transport of water, minerals and organic compounds, as well as with the mechanical support of the leaf blade. The venation network is therefore simultaneously a system of nutrition, communication and structural support. In the leaf, the Matrix manifests itself as a network of flows. Form becomes visible because flows and supporting lines organise the surface.

This network has a hierarchical character. The principal vein may produce first-order lateral veins, which in turn produce smaller branches, ultimately creating a network of fine lines delimiting areas of tissue. This hierarchy makes the leaf a natural example of self-similarity in nature. The same logic of branching recurs at different scales, although neither infinitely nor perfectly. The leaf therefore prepares the transition to the fern as a more expressive fractal model.

The fractality of the leaf must, however, be understood with caution. A leaf is not a strict mathematical fractal. Its self-similarity is limited by size, function, plant species, growth conditions and tissue characteristics. At the morphological level, however, the leaf genuinely demonstrates a repetition of the principle of branching: principal line—lateral lines—fine network—edge. This is a natural, finite and variable form of self-similarity. It is precisely this form that is important to the hypothesis of the Matrix.

The leaf is also a model of distribution between centre and periphery, although its centre is often expressed not as a point, but as a line. In the flower, the centre is usually localised within a central region. In the leaf, centred organisation extends along the vein. The leaf therefore helps to broaden the concept of the centre. A centre may be not only a point or nucleus, but also an axis, line or direction from which the surface is organised. This makes the leaf particularly important to the general theory of the Matrix: it demonstrates the linear centre of a planar form.

The base of the leaf is also of considerable importance. Through its base, the leaf is connected with the stem, petiole, node and vascular system of the plant. Distribution across the blade begins at the base. The form of the leaf is therefore not autonomous. It is incorporated into the plant as a whole. Just as the flower is connected with the stem and the fruiting cycle, the leaf is connected with the stem, root, branch, flow of substances and the life of the plant as a whole. The plane of the leaf is open to the environment, but rooted in the organism.

This allows the leaf to be considered as an intermediate structure between the internal and external. On the one hand, it belongs to the plant and receives water, substances and support from it. On the other, it is exposed to the external world to the greatest possible degree: to light, air, moisture, wind, temperature, damage and insects. The leaf is an organ of external contact. Its morphology develops at the boundary between the plant's internal life and its external environment. The leaf Matrix is therefore a Matrix of exchange.

The growth area of the leaf is particularly important for understanding unfolding. Unlike the stem, Which primarily expresses a vertical direction, the leaf creates a surface. Its growth involves the

expansion of an area, the filling of the space between the veins, and the formation of tissue and the edge. In this sense, the leaf demonstrates how the Matrix passes from an axis to a field. The central vein establishes a direction, but the true leaf form emerges only when a field of tissue develops around this axis. The leaf is a plane organised around a line.

This proposition has considerable significance for subsequent comparisons. In geology, surfaces of relief, fracture networks, river basins and layered formations may be considered as forms in which lines, networks and surfaces are interconnected. In the cosmos, shells, fronts and filamentary structures may be analysed as forms of matter distribution. In culture, ornament, the page, the façade, the map, fabric and the architectural surface may be considered as analogues of the organised plane. The biological leaf, however, provides the primary and clearest material for such an understanding.

The leaf also demonstrates that a surface may be heterogeneous. It possesses upper and lower sides, different textures, colours and densities, and may have hairs, a waxy coating, pores, veins, spots and damage. The plane of the leaf is therefore not abstractly identical at every point. It is zonal. Some areas lie closer to the base and others to the edge; some are positioned along the veins and others between them; some receive more light while others remain in shade; some are damaged while others preserve their integrity. The leaf is a specific living surface rather than an idealised scheme.

This heterogeneity is important to the Matrix. Form does not unfold as an absolutely uniform geometry, but as a differentiated surface. The leaf contains visible zones, directions, distinctions and gradients. Its colour may change from centre to edge, from the vein to the interveinal area, or from base to apex. Its texture may be denser along the veins and softer between them. Damage may record interaction with the external environment. The leaf is therefore a map not only of internal growth, but also of its external history.

The asymmetry of the leaf is also significant. Even If the general type of leaf is symmetrical, an actual leaf may contain minor deviations: one edge may be wider than the other, the veins may be unevenly developed, the edge may be damaged or curved, and the surface may be slightly twisted. This asymmetry does not destroy the leaf form. It demonstrates that a universal structure is realised through individual conditions. Like the flower, the leaf reveals the unity of invariant and variation.

It is precisely this that makes the leaf a particularly useful object for morphological analysis. Its general plan can readily be identified: base, central vein, lateral veins, blade and edge. Yet every individual leaf differs in detail. Such a structure allows the Matrix to be perceived not as a rigid template, but as a recurring organisational logic that permits individuality. The leaf is not a copy of an ideal form, but a living variant of a morphogenetic principle.

Different types of leaves demonstrate different modes of planar unfolding. A simple leaf with a single central vein displays an axial-pinnate structure. A palmate leaf demonstrates the distribution of several principal directions from a single basal region. Parallel venation demonstrates another principle: several lines extend almost in concert along the blade. Dissected leaves demonstrate a pronounced differentiation of the edge and surface. Compound leaves demonstrate how the leaf form may divide into leaflets while retaining an overall axial or palmate organisation. This diversity confirms that the Matrix does not possess a single external configuration.

Leaves with a pronounced reticulate structure are especially important. They reveal clearly how the primary and secondary veins form a hierarchical network. Such a network connects the axis, lateral branches and edge. It may resemble a river basin, fracture system, vascular network or road map, but in its biological context it possesses its own specific function. The leaf network therefore provides powerful morphological material for subsequent comparisons, but those comparisons must remain cautious. Similarity between networks does not imply identity of mechanisms.

The leaf also allows the distinction between structural analogy and functional identity to be demonstrated. A leaf vein, river network and fracture may possess branching forms, but their physical causes differ. A vein grows as part of living tissue, a river forms through the flow of water across relief, and a fracture arises from stresses within a material. They may be compared as morphological networks, but their mechanisms must not be conflated. The biological leaf helps establish this analytical discipline.

The leaf surface is also connected with the concept of the ‘field’. The leaf contains not only lines, but also the areas between them. These areas are no less important than the veins. They perform the principal photosynthetic function, create the mass of the leaf blade and form the visible surface. The veins organise the field, but the field gives the leaf its area. The leaf is therefore a system of ‘line—network—field—edge’. This formula may become one of the key principles for analysing the planar unfolding of the Matrix.

In this sense, the leaf differs from the fern, which will be examined in the following section. The fern is particularly expressive as a fractal model because the principle of branching is often repeated many times within the structure of its frond. An ordinary leaf may be more continuous and planar. Yet the leaf as a simple plane of unfolding is necessary as preparation for the fern. The relationship between vein, area and edge must first be understood before proceeding to more complex self-similar subdivision.

The leaf is also connected with the succulent, which will be examined later. The individual leaves of a succulent may be thick, fleshy and arranged in layers around a centre, often forming a rosette. There, the leaf ceases to be merely a flat blade and becomes a module of layered symmetry. Yet the principle of the leaf as an element of unfolding is preserved. The succulent demonstrates not so much a leaf network as a modular packing of leaves. The chapter therefore proceeds gradually from the plane of the leaf to the fractality of the fern and the layered symmetry of the succulent.

The leaf as a plane of unfolding also possesses aesthetic expressiveness. Its beauty is often connected not with vivid colour, as in the flower, but with the clarity of its structure: the line of the vein, the rhythm of the lateral branches, the symmetry or asymmetry of the blade, the complexity of the edge, the translucency of the tissue and the pattern of the network. The beauty of the leaf is the beauty of an organised surface. It reveals not the explosive flowering of the plant, but the calm architecture of growth and exchange. This makes the leaf especially important to a scientific and philosophical understanding of form.

In cultural terms, the leaf frequently becomes a symbol of life, growth, the tree, nature, breath and renewal. In this chapter, however, its significance is primarily biological and morphological. The leaf is genuinely an organ of growth and exchange. Its symbolic power is connected with its natural function. The cultural use of the leaf in ornament, architecture, heraldry or artistic imagery may therefore be examined later, but here it is important to demonstrate that the leaf is significant because its structure objectively expresses the unfolding of a living surface.

Several principal parameters may be identified for the analysis of the leaf within the Matrix. The first is the base of the leaf and its connection with the stem. The second is the central vein or principal directions. The third is the lateral veins and the type of branching. The fourth is the area of the leaf blade. The fifth is the character of the edge. The sixth is symmetry or asymmetry. The seventh is the folds, curves and traces of unfolding. The eighth is the relationship between the surface and the function of exchange. These parameters allow the leaf to be interpreted not as a decorative form, but as a morphogenetic structure.

Such a parametric approach is particularly important to the study as a whole. If leaves, ferns, succulents, stone textures, cosmic structures and cultural artefacts are subsequently to be compared, a clear language of description is required. The leaf provides this language: axis, branch, network, field, edge, surface, fold, growth and exchange. These concepts may also be used beyond botany, but only with due regard for differences in mechanisms. The biological leaf provides the initial teaching material for a disciplined morphological interpretation.

Images of leaves with a clearly defined central vein and lateral branches are particularly important for the illustrations accompanying this section. Such an image would demonstrate the leaf as an axial plane of unfolding (*Fig. 1*). A second image might present a close-up of the venation network, revealing the primary, secondary and finer veins that create a hierarchical distribution across the surface (*Fig. 2*). A third image might demonstrate the leaf edge—serrated, undulating or lobed—as an active boundary of growth and interaction with the environment (*Fig. 3*).

These illustrations should be analytical rather than decorative. The caption to the first image may identify the central vein as the axis of unfolding. The caption to the second may describe the venation network as a map of distribution. The caption to the third may identify the edge as both the limit and the active periphery of the leaf form. Presented in this manner, the visual material will support the text rather than merely accompany it.

The leaf may also be shown as a developmental sequence: a young rolled leaf, a partially unfolded leaf and a mature leaf blade. Such a sequence is particularly useful for demonstrating the A–B–C–D model at the level of the leaf. The young rolled leaf corresponds to the closed state; partial unfolding to the initial emergence; the formation of the venation network and surface area to the stage of multilayered structure; and the mature leaf to the full manifestation of the plane. This would demonstrate that the leaf, like the flower, possesses its own morphogenetic cycle.

Even the mature leaf, however, is not an absolute final state. It functions, ages, sustains damage, turns yellow, falls, decomposes and returns substances to the soil, thereby participating in the broader cycle of the plant and its environment. The leaf form is therefore also incorporated into cyclicity. It does not produce a seed directly, as the flower and fruit do, but it sustains the organism capable of reproduction. The leaf is an organ of vital exchange without which the entire reproductive cycle would be impossible.

This qualification is important for understanding the place of the leaf within the biological Matrix. The leaf is not a reproductive centre in the same sense as the flower and fruit. Its task is different: to unfold a surface of exchange, support growth, and sustain the plant’s energetic and material processes. Yet it is fundamental for precisely this reason. Without the plane of the leaf, the plant could not fully develop its flowers, fruits and seeds. The leaf is a matrix of nutrition and exchange, rather than a matrix of seed multiplicity.

Thus, within the hypothesis of the Unified Matrix of the Universe, the leaf may be understood as a plane of unfolding. It demonstrates how the central vein becomes an axis, how the lateral branches transform a line into a network, how the network organises an area, how that area enters into exchange with the environment, and how the edge completes the form while simultaneously opening it to the external world. The leaf combines axis, surface, branching, edge and function within a single biological object.

The leaf is therefore not a simple plane, but a living morphogenetic map. Its central vein establishes direction; its lateral veins, distribution; its blade, the area of growth and exchange; its edge, the active periphery; and its folds and curves, the memory of unfolding. Through the leaf, it is possible to observe how the Matrix operates in the mode of planar unfolding: the concealed form opens, the line becomes a network, the network creates a field, the field enters into the environment, and the edge establishes the limit of the living surface. The following section will examine a more complex instance—the fern as a fractal model of plant self-similarity.

11.2. The Fern as a Fractal Model

The fern occupies a distinctive place among plant forms because the principle of self-similarity is expressed within it with particular clarity. Whereas an ordinary leaf demonstrates a plane of unfolding through its central vein, lateral branches, surface and edge, the fern presents a more complex case: its leaf structure appears to repeat itself at different levels. The complete fern frond, its lateral pinnae, smaller segments and individual leaflets form a hierarchy in which the same logic of branching and subdivision recurs at a reduced scale. The fern is therefore one of the most compelling biological models of natural fractality.

In the strict mathematical sense, the fern is not an infinite fractal. Its structure is finite, biologically constrained and dependent upon species, age, environment, humidity, illumination and the condition of the plant. In morphological terms, however, the fern exhibits pronounced natural self-similarity. The general form of the frond is repeated in its lateral parts; the lateral parts are repeated in smaller segments; and the segments may retain a similar orientation, edge and rhythm. This is not a perfect geometric copy, but a living recurrence of a principle.

It is precisely this recurrence that is particularly important to the hypothesis of the Unified Matrix of the Universe. The Matrix does not require the mechanical copying of a single form. It presupposes the preservation of a structural invariant across changes of scale. The fern demonstrates this almost visibly: the large and small forms are not identical, but they are related through their organisational logic. The axis, lateral branching, progressive reduction, rhythm, edge and direction of unfolding recur within them. The fern may therefore be considered as a botanical model of an invariant expressed through variation.

The principal axis of the frond forms the foundation of the fern’s structure. Lateral segments extend from it, and these segments themselves possess an internal axial organisation. Smaller leaflets or lobes may extend from these segments. In the fern, therefore, the central axis does not merely distribute a surface, as it does in an ordinary leaf, but generates an entire system of recurring levels. The fern transforms the plane of the leaf into a hierarchical structure. It demonstrates how a single axis may become the source of numerous nested axes.

This structure is particularly important for understanding the fractal principle. Fractality is manifested here not only in the similarity of the external contour, but also in the recurrence of relationships. At each level, there is a principal line, lateral branches, edges and a progressively diminishing periphery. What constitutes part of a large frond at one level becomes a small frond in its own right at another. The part repeats the organisational logic of the whole. This makes the fern a classic example of natural self-similarity.

The fern demonstrates that self-similarity need not be absolute. A lateral segment is not an exact copy of the entire frond. It is smaller and simpler, and may possess a different degree of dissection, angle of divergence or form of edge. Yet it preserves the principal structure: an axis and lateral subdivision. Such incomplete and variable recurrence is characteristic of living nature. Living fractality is always connected with material, growth, function and constraint. It is not infinite, but is sufficiently pronounced to possess morphological significance.

The hierarchy of scale is especially apparent in the fern. The first scale is the complete frond as a large leaf structure. The second comprises the lateral pinnae or segments. The third comprises the smaller lobes. The fourth is the edge of each small element. In some cases, still finer levels can be observed: veins, small branches, serrations and the microrelief of the surface. At each level, the form becomes smaller while retaining its connection with the general logic. The fern is therefore not merely a leaf, but a system of nested leaf-like forms.

This nestedness makes the fern particularly important to the biological level of the Matrix. The preceding chapters have already demonstrated that a seed may contain a future organism, a bud a future flower, and a fruit numerous future seeds. The fern demonstrates another type of nestedness: one that is not temporal, but spatial and scale-dependent. The same morphological logic is unfolded simultaneously across several levels. The fern is therefore a model not only of a cycle, but also of self-similarity across scales.

The fractality of the fern is connected with its growth. young fern fronds frequently unfold from a coiled state, forming a characteristic spiral or curl. This curl gradually straightens, and the future leaf structure unfolds into external space. Two principles are combined here: the spiral unfolding of the young form and the fractal subdivision of the mature form. The fern demonstrates that self-similarity may arise not as a completed ornament, but as the result of successive growth and unfolding.

The coiled young frond constitutes a particularly expressive stage A or B of the local cycle. Its future complex structure has not yet unfolded. The lateral segments may be concealed or tightly gathered, the surface has not yet opened, and the edge has not yet become fully manifest. As growth proceeds, the curl unfolds, the axis lengthens, the lateral elements move apart and the smaller segments become visible. The fern therefore demonstrates not only mature self-similarity, but also the process through which it emerges.

This allows the fern to be considered through the A–B–C–D model. Stage A is the coiled young frond, in which the future structure is contained in a compact state. Stage B is the beginning of unfolding, when direction and the first axis emerge. Stage C is the opening of the lateral segments and the formation of a multiscale structure. Stage D is the mature frond, in which self-similarity becomes most clearly visible. In this description, the fern becomes not only a fractal form, but also a morphogenetic process.

The principal error in analysing the fern would be to perceive it solely as a beautiful pattern. The structure of the fern is not a decorative accident. It is connected with growth, photosynthetic

surface area, the distribution of tissues, the mechanics of the leaf and interaction with the environment. Its branched and dissected form increases surface area, distributes leaf elements through space, creates flexibility and allows the plant to exist efficiently within its particular ecological conditions. The fractality of the fern therefore possesses biological meaning.

The fern also demonstrates that fractality may be functional. Repeated subdivision helps to organise a large surface through numerous small units. Instead of a single continuous blade, the fern creates a complex system of lobes. Such a system may be flexible, resilient and well adapted to a moist environment, light, air movement and the constraints of growth. Self-similarity is therefore not merely an aesthetic feature. It may be a means of constructing a living surface.

In this respect, the fern continues the theme of the leaf as a plane of unfolding, but takes it to a higher level of complexity. An ordinary leaf demonstrates a line, network, field and edge. The fern demonstrates a line that produces further lines; a field that divides into smaller fields; an edge that is repeated in smaller edges; and a structure that partially reproduces itself at different levels. It is not merely a plane, but a repeatedly subdivided plane. The fern demonstrates how leaf form may become a fractal system.

The recurrence of the edge is particularly important. The fern's edge may be dissected, serrated, lobed, pinnate or divided several times. The edge of the complete frond is repeated in the edges of its lateral segments and smaller lobes. This makes the edge of the fern one of the principal features of its fractality. Whereas the edge of an ordinary leaf completes a single blade, the numerous smaller edges of a fern create a complex hierarchy of peripheries. The periphery is multiplied many times.

This multiplicity of edges possesses morphogenetic significance. Each small lobe of the fern is a small unfolded surface with its own boundary. Instead of one large edge, there are numerous small active peripheries. This increases the complexity of contact with the environment. The fern appears to divide a single leaf surface into numerous smaller surfaces, each of which retains its connection with the whole. This expresses a particular logic of fractal botany: the whole becomes a multiplicity of interconnected smaller wholes.

The fern also demonstrates the relationship between fractality and branching. Branching within a plant may be expressed through roots, stems, trees and leaf veins. In the fern, branching is incorporated into the very form of the leaf. The principal axis produces lateral segments, which may produce smaller segments, while the small lobes continue the overall rhythm. The fern may therefore be regarded as a leaf in which the principle of branching has become the dominant mode of constructing the plane.

This branching is not chaotic. It possesses order, rhythm, direction and progressive reduction of scale. The lateral elements are often arranged sequentially along the axis, diverge at similar angles, diminish towards the apex and retain their relationship with the overall form. This ordered arrangement allows the fern to be perceived as an integral structure despite its many parts. This is precisely what is important to the Matrix: a multiplicity of elements does not destroy the whole when it is organised through a recurring principle.

The fern also provides a good example of how natural form combines symmetry and asymmetry. The frond may possess overall bilateral symmetry in relation to its principal axis, but each individual segment may display its own deviations, curves, damage and variations in size and form. The fern is therefore not a mechanically precise ornament. It is living, variable and

individual. Symmetry establishes the general order, while asymmetry records the history of growth and interaction with the environment.

Such organised variability is particularly important for understanding the Matrix. If the fern were absolutely regular, it would more closely resemble a geometric ornament. Its natural strength, however, lies elsewhere: it retains a recognisable fractal logic despite numerous minor deviations. This makes it a powerful model of living self-similarity. The universal principle is manifested not through a perfect copy, but through the rhythmic affinity of its parts.

The fern also allows us to examine the relationship between centre and axis. In the flower, the centre is often a point or region. In the leaf, the centre may be a line. In the fern, the principal axis becomes the main organising centre, while each lateral segment also acquires its own smaller axis. A hierarchy of centres emerges: the large axis, lateral axes and smaller axes of the lobes. This demonstrates that centred organisation may be distributed. The Matrix does not always possess a single centre; it may contain a system of nested centres.

This system of nested centres is especially important for the transition to more complex natural and cultural structures. A tree possesses a trunk, branches, twigs and leaves. A river system contains a principal river, tributaries and small streams. A nervous or vascular system contains principal and secondary pathways. Architecture contains a principal volume, secondary spaces and details. The fern is a botanically clear model of such a hierarchy. It demonstrates how centred organisation may multiply within a structure without destroying the whole.

The fractal model of the fern is also connected with the concept of scale. Viewed from a distance, the overall form of the frond is visible. Viewed more closely, the lateral segments become apparent. At a still closer scale, smaller lobes and veins emerge. A new structure appears at each level. This teaches a particular mode of interpreting form: the scale of observation must be varied. The Matrix manifests itself not only at the level of the whole, but also in its details. The fern demonstrates particularly clearly the necessity of multiscale analysis.

Interpretation across scales is one of the key methodological principles of the entire study. If a form is observed only from a distance, its overall symmetry may be perceived while its internal network is overlooked. If only a detail is examined, the whole may be lost. The fern requires the observer’s gaze to move from the complete frond to the segment, from the segment to the lobe, from the lobe to the edge and from the edge to the vein. Such movement makes it possible to see how the same morphogenetic principle recurs and changes across different levels.

The fern also demonstrates that fractality is connected with an economy of form. Nature does not create each part as an entirely new and independent structure. It repeats a functional principle with modifications. The frond, segment, lobe and smaller lobe are organised in similar ways. Such repetition creates complexity without complete chaos. The form becomes rich while remaining legible. This may be described as an economy of morphogenetic language: numerous forms are created through variations of a single principle.

Within the hypothesis of the Matrix, this is highly significant. Universal invariants operate in precisely this manner: they do not replace particular forms, but create a language through which those forms are constructed. Axis, branching, edge, layer, self-similarity and unfolding may recur in different combinations. The fern demonstrates how a single language creates numerous levels. It is a living example of morphological grammar: the larger form consists of smaller forms, but all of them follow a similar rule.

The fern is also important because it combines planarity with branching. A tree branches through volume. A leaf unfolds into a plane. The fern occupies an intermediate position: it is a leaf structure constructed as a branching system. This makes it particularly suitable for analysing the transition between the leaf and the tree. It demonstrates that a plane may be branching and that branching may be organised as a surface. This intermediate character makes the fern an important element of fractal botany.

In the present context, fractal botany does not denote a separate, strictly mathematical discipline, but a mode of analysing plant forms in which repetition, self-similarity, branching and scale hierarchy play key roles. Ferns, leaves, trees, inflorescences, root systems, venation networks and rosettes may be considered as different manifestations of this logic. The fern, however, is one of the clearest examples because its self-similarity is visible without specialised instruments.

The fern also demonstrates the relationship between fractality and growth from base to apex. The frond possesses direction. It is not merely a symmetrical figure. Its segments are generally arranged along the axis in a particular sequence, often diminishing towards the apex. This creates an impression of formal movement. The fern not only branches, but is also directed. Its fractality is not static; it is incorporated into a trajectory of growth. The fern is therefore not merely a self-similar pattern, but a self-similar process.

This directionality is particularly important for distinguishing living fractality from decorative ornament. An ornament may repeat an element indefinitely or almost mechanically. The fern repeats an element within the process of growth: from base to apex, from larger to smaller, and from axis to edge. Its self-similarity has a biological direction. It is connected with the plant's development rather than with the abstract filling of a surface. The fern should therefore be analysed as a processual form.

The fern also makes it possible to observe how fractality is connected with the youth and maturity of form. The young coiled frond contains the future fractal structure in a compressed state. The mature frond reveals it. An ageing frond may lose its resilience, change colour, sustain damage, dry out and decay. Fractal form therefore also possesses a life cycle. It does not exist outside time. At each moment, self-similarity may possess a different degree of manifestation: concealed, unfolding, mature or disintegrating.

This returns us to the A–B–C–D model. The fern demonstrates that fractality may be a stage of unfolding rather than merely a final structure. Self-similarity becomes visible in the mature frond, but it was prepared within the coiled young form. The researcher must therefore observe not only the final fractal configuration, but also the process of its unfolding. Otherwise, the fern will be perceived as a static pattern rather than as living morphogenesis.

The fern is also connected with the theme of the memory of form. The coiled frond contains the future structure in a concealed state. As it unfolds, its segments assume their positions, its edges become visible and its recurring hierarchy is revealed. The mature frond preserves the memory of its coiled state through its curves, directionality and sequence of segments. Even if the observer sees only the unfolded form, it retains a trace of the preceding stage. The fern demonstrates that fractality may constitute the memory of unfolded growth.

The sequence of the young coiled frond and mature fern is especially important for the illustrations accompanying this section. The first image should present the spiral curl of the young frond as the closed or initial state of fractal form (*Fig. 4*). The second should present the complete

mature frond, revealing the principal axis and lateral segments (*Fig. 5*). The third should show a close-up of a lateral segment, demonstrating the repetition of the same logic at a smaller scale (*Fig. 6*). Such a series would present the fern not merely as a beautiful form, but as a structure of self-similar unfolding.

A comparative image showing the complete frond, one of its fragments and a small leaflet arranged alongside one another in a sequence of scales may be particularly useful. Such an image would reveal how the part repeats the principle of the whole. Its caption should be precise: 'The fern as a natural model of self-similarity: the principal frond, lateral segment and small lobe repeat a similar logic of axes and branches.' This would help prevent a merely decorative perception and direct attention towards the structure.

The fern may also be used in preparation for subsequent comparisons with geological and cosmic forms. Its branching may resemble river networks, fractures, lightning, blood vessels, trees, corals or cosmic filaments. Such comparisons must, however, be made cautiously. The fern is a living plant structure produced through biological growth. A river network emerges through the movement of water across relief, a fracture through stresses within a material, and a cosmic filament through processes involving the distribution of matter in the Universe. The similarity may be morphological, but it is not causal.

The fern is important precisely as a model of biological self-similarity rather than as universal proof. It demonstrates what self-similarity looks like within a living form. This model may subsequently assist in analysing other structures, but only if their mechanisms are clearly distinguished. If another system exhibits recurring axes, branching and a hierarchy of scales, morphological correspondence may be identified. It cannot, however, automatically be claimed that all such forms possess a single source or mechanism.

The fern also demonstrates that fractality is connected with the boundary between order and complexity. It is not chaotic: its structure is clearly organised. Yet neither is it simple: it contains numerous levels, segments, edges and small elements. The fern is therefore a form of complex order. It demonstrates that complexity in nature may remain legible when it possesses a recurring principle. The Matrix seeks precisely to describe such principles through which complex form becomes legible.

This makes the fern an important object for the philosophy of form. It demonstrates that a whole may be complex without losing its unity. Its parts may be numerous without becoming chaotic. Repetition may be regular without becoming mechanical. Differences may be individual without destroying the invariant. In the fern, unity and multiplicity, order and variation, axis and network, and part and whole are combined with particular clarity.

The fern also possesses aesthetic significance. Its beauty is based upon the rhythm of repetition, subtle hierarchy, progressive reduction, gentle symmetry, numerous small edges and overall integrity. Yet this aesthetic quality is a consequence of morphology. The fern is beautiful because its form is organised. The aesthetic impression may serve as the beginning of analysis, but should not replace it. It is necessary to recognise that the beauty of the fern is the beauty of fractal morphogenesis.

Throughout cultural history, the fern has often been perceived as a mysterious, ancient plant associated with shade and forests. Its cultural associations, however, are not the principal subject of this chapter. The concern here is its structure. The fern demonstrates that a plant form

may be self-similar, multiscale, hierarchical and simultaneously living. Its significance to the hypothesis of the Matrix lies not in fern mythology, but in its morphological clarity.

Several parameters may be distinguished when analysing the fern. The first is the principal axis of the frond. The second is the lateral segments and their arrangement. The third is the degree to which form is repeated at smaller levels. The fourth is the manner in which the elements diminish from base to apex. The fifth is the form of the edge and smaller lobes. The sixth is the presence of a fold or spiral curl at the early stage. The seventh is the degree of symmetry and individual variability. The eighth is the relationship between structure and the function of the leaf surface. These parameters make it possible to describe the fern rigorously as a fractal model rather than merely through imagery.

Such a parametric approach is particularly important for future illustrations. If photographs of ferns are used in the book, they should show not merely an attractive green leaf, but the levels of self-similarity. For example, they may present the complete frond, an enlarged lateral segment and an enlarged small lobe. The reader would then be able to see that the analysis concerns not an impression, but the repetition of structural logic. This may be achieved through either a series of images or a single image with highlighted scales.

The fern also allows the concept of the fractal invariant to be clarified. Here, the invariant is not the particular form of a leaflet. It consists in the recurring relationship: axis—lateral branch—reduction—edge—new smaller axis. This relationship may be expressed at different levels. The fractal invariant of the fern is therefore not a visual copy, but a structural rule. This is how the fractality of the Matrix should be understood in a biological context.

Extending this understanding more broadly, the fractality of the Matrix may be described as the capacity of form to repeat its organisational logic within its parts. The fern makes this capacity visible. Its parts do not merely resemble the whole; they participate in its construction. The whole exists through the recurring parts, while the parts are interpreted through the whole. This reciprocal relationship is one of the principal reasons why the fern should be included in the chapter on fractal botany.

The fern also demonstrates the limitations of the fractal model. Not every part of the fern resembles the whole to the same degree. Self-similarity ends at a particular scale. Tissues, cells and microstructures no longer repeat the form of the complete frond. This is important: natural fractality has limits. It operates within a particular range of scales. Whenever the term ‘fractality’ is used in this book, it should therefore be made clear that it refers to finite natural self-similarity rather than infinite mathematical recursion.

This qualification makes the hypothesis more rigorous. If the entire world is declared fractal without qualification, the concept loses precision. The fern teaches the opposite: self-similarity is real, but it possesses scale boundaries. It is expressed at some levels and weakens at others. It depends upon material and function. Fractality must therefore be described as a parameter of form rather than as an absolute property of all existence.

The fern is also useful for understanding the distinction between fractality and simple repetition. If identical elements are merely repeated in a row, this does not in itself constitute fractality. Fractality presupposes the repetition of structure across different scales. In the fern, it is not only the elements that recur, but also their organisation: a large axis with lateral lobes and a smaller axis with smaller lobes. The fern is therefore a stronger model than simple ornamental repetition. It demonstrates nestedness across scales.

This distinction will be important to the cultural sections of the study. An ornament may be repetitive without necessarily being fractal. A mandala may be radial without necessarily being self-similar. An architectural façade may possess rhythm without necessarily displaying recurrence across scales. The fern helps establish a criterion: a fractal structure must demonstrate the repetition of organisational logic between levels. Without this, there is merely repetition or rhythm, rather than self-similarity in the strict morphological sense.

Within the biological Matrix, the fern occupies a position between the leaf and the tree. The leaf demonstrates a plane. The tree demonstrates volumetric branching. The fern demonstrates a fractal leaf plane. It combines a surface with a branching hierarchy. It is therefore an ideal transitional object within Chapter 11. Following the leaf as a plane of unfolding, the fern demonstrates how that plane may be constructed through recurring scales. Following the fern, the succulent will demonstrate another principle: layered symmetry and rosette packing.

Thus, within the hypothesis of the Unified Matrix of the Universe, the fern may be regarded as one of the clearest fractal models of living form. It demonstrates the repetition of axes, branches, edges and small surfaces across different scales. Its structure reveals that a part may reproduce the organisational logic of the whole, but with modifications, constraints and biological variability. The fern is not a mathematical abstraction, but a living example of finite natural self-similarity.

The fern therefore allows the fractality of the Matrix to be observed in a biologically concrete form. The coiled young frond contains the future self-similar structure; the unfolded frond reveals a hierarchy of axes and segments; the lateral lobes repeat the principle of the whole; the edges multiply the periphery; and progressive reduction of scale creates a legible complex order. Through the fern, it becomes clear that fractality in living nature is not infinite geometry, but a means of organising growth, surface and multiplicity through the repetition of a structural principle at different levels.

11.3. The Succulent as a Model of Layered Symmetry

Following the consideration of the leaf as a plane of unfolding and the fern as a fractal model, it is necessary to examine another important type of botanical form: the succulent rosette. Succulents provide distinctive material for the hypothesis of the Unified Matrix of the Universe because plant form unfolds within them not so much through the thin plane of a leaf or the fractal branching of a fern as through layered symmetry, modularity and the spiral-radial arrangement of elements around a centre. In the succulent, the Matrix manifests itself as a dense, compact, multilayered and simultaneously open structure.

The succulent rosette immediately attracts attention through its centred organisation. At its centre is a dense zone of growth around which the leaves are arranged. The inner leaves are usually smaller, more densely packed, more enclosed and closer to a state of potential unfolding. The outer leaves are larger, broader and more fully opened, and form the periphery. Different stages of unfolding are therefore simultaneously visible within a single form: the new within, the unfolding middle and the mature exterior. The succulent presents the Matrix not as a sequence of separate frames, but as the simultaneous coexistence of stages.

This makes the succulent a particularly important object of analysis. Whereas the bud and the open corolla of a flower usually exist as different phases, closure and openness are often present simultaneously within a succulent rosette. The centre remains dense and almost bud-like, while the periphery has already opened. The inner leaves appear to preserve stage A, the middle leaves pass through B and C, and the outer leaves approach D. The succulent may therefore be regarded as a living diagram of the gradual unfolding of form from centre to edge.

The principal characteristic of the succulent rosette is layered symmetry. The leaves are arranged neither within a single plane nor in a simple radial configuration, but in layers. Each new row partially overlaps the preceding one or is displaced in relation to it. The result is an impression of depth, spiral movement and repeated unfolding. Although the succulent may outwardly resemble a flat flower, its symmetry is more three-dimensional, dense and modular. It is constructed through the repetition of leaves arranged around the centre at different levels.

The layer possesses particular significance in the succulent. It is neither the concealed layer of the bud nor a layer transformed into a petal, but a visible row of leaf modules. Each layer is formed from leaves occupying a particular position within the rosette. The inner layers are younger, while the outer ones are older. The layering of the succulent therefore possesses temporal meaning. The rosette reveals the history of its growth: what is now located at the centre may subsequently move outwards, while what is currently at the periphery was once closer to the centre. The form of the succulent is a spatial record of time.

It is precisely this connection between layer and time that makes the succulent an important model of the Matrix. It demonstrates how the new emerges at the centre and then gradually unfolds and moves towards the periphery. The centre does not remain merely a point of organisation; it continuously produces new elements. The periphery is not an accidental edge; it consists of elements that have travelled from internal density towards external openness. The succulent rosette thus displays the cycle ‘centre—layer—unfolding—periphery’ in continuous form.

The spiral displacement of the leaves is one of the principal features of the succulent structure. The leaves are rarely positioned directly above one another. They are usually displaced so that each new element occupies a gap between the preceding ones, acquiring space, light and the opportunity for growth. This creates a spiral-radial order. Viewed from above, the rosette may appear almost circular, but closer examination reveals that its elements do not simply extend as rays; instead, they are progressively displaced around the centre.

The spirality of the succulent differs from the spiral distribution of seeds in the sunflower, but both cases demonstrate the same general morphological task: arranging numerous elements around a centre without chaotic superimposition. In the sunflower, these elements are seeds across a disc; in the succulent, they are modular leaves within a rosette. In both cases, spirality is connected with dense packing, growth, the distribution of space and the preservation of integrity. Their mechanisms, however, differ: the seed-bearing disc and the succulent rosette possess different biological natures. They may therefore be compared morphologically, but must not be identified with one another.

The succulent rosette also demonstrates that radiality need not be planar, but may instead be layered. A flower frequently unfolds as a plane or cup. A succulent unfolds as a multilayered three-dimensional structure. Its leaves form not only radii, but also tiers, levels and overlaps. Whereas a flower may be regarded as the unfolding of petals around a centre, the succulent may

be regarded as the prolonged accumulation of leaf modules around a central growth point. Its radiality is the result of the repeated addition of layers.

This type of form is particularly important for understanding the Matrix as a dynamic system. A succulent rosette is not created instantaneously. It gradually accumulates leaves. Each new leaf is added to the existing structure. The form expands while preserving its centre. It grows without losing its symmetry. It increases in size while remaining legible. This demonstrates that the Matrix may manifest itself as the sustained accumulation of order over time.

The modularity of the succulent is evident. Each leaf is a recurring element, but not an exact copy of the others. The inner leaves are smaller and more densely packed, while the outer leaves are larger and broader. Some leaves may be more elongated and others more rounded; some may possess red or pink tips, while others have a softer green surface; some may be positioned almost vertically, while others are more horizontal. This variable modularity makes the succulent a living form rather than a mechanical ornament. Repetition is combined with change.

It is precisely modularity that allows the succulent to serve as a model of layered symmetry. The rosette is constructed from numerous leaves, each possessing its own form, thickness, edge, surface, direction and position. Yet all of them are subordinated to a common centred organisation. The resulting structure allows each part to retain its individuality while contributing to the whole. This is one of the most important principles of the Matrix: the whole arises not through the elimination of differences, but through the coordination of recurring elements.

A succulent leaf differs from an ordinary thin leaf. It is often thick, fleshy and filled with moisture, with a smooth or waxy surface. This form is connected with the function of storing water and surviving under conditions of limited moisture. Succulent morphology therefore possesses an ecological basis. The thickness of the leaves, dense packing, reduced evaporative surface, waxy coating and compactness of the rosette are all connected with adaptation. The layered symmetry of the succulent is consequently not merely an aesthetic phenomenon. It possesses biological meaning.

This point is particularly important to the scientific accuracy of the hypothesis. The succulent is beautiful because its form is ordered, but that order does not exist for the sake of beauty. It is connected with growth, water balance, illumination, protection, resilience and the spatial arrangement of the leaves. The analysis of the succulent must therefore combine morphology and function. At the biological level, the Matrix manifests itself as a form operating within an environment rather than as abstract geometry.

The centre of the succulent rosette may be understood as an active zone of renewal. New leaves emerge within it before they have fully opened. This centre resembles a bud, but is not identical to one. A bud prepares a flower for a particular unfolding, whereas the centre of a rosette continually produces new leaf modules. The succulent therefore combines bud-like closure with a prolonged growth process. Its centre does not merely conceal a future form; it continuously creates it.

The inner centre of a succulent often appears as a dense spiral or a small closed rosette. This is particularly important for visual analysis. A small rosette within a larger rosette can be observed within the same form. This relationship resembles self-similarity, but differs from the fractality of the fern. In the fern, self-similarity is expressed through a branching hierarchy of axes and segments. In the succulent, it is expressed through the recurrence of rosette organisation: a small centre within a larger centre and inner leaves within outer layers.

The self-similarity of the succulent is therefore layered rather than branching. It is constructed through the concentric and spiral addition of modules. The inner layer resembles a reduced version of the entire rosette without copying it completely. The outer layers expand this structure. Each new level remains connected with the centre. The succulent thus demonstrates another type of fractal botany: not the fern-like recursion of branches, but the rosette-like recursion of layers.

This distinction is important to the chapter. The leaf demonstrates a plane of unfolding, the fern fractal branching and the succulent layered symmetry. All three forms belong to the botanical level of the Matrix, but each reveals a different aspect. The leaf answers the question of how a line becomes a plane. The fern demonstrates how a part repeats the structure of the whole. The succulent demonstrates how a centre produces layers and how those layers create a symmetrical three-dimensional form. Together, they provide a multidimensional understanding of plant morphology.

The succulent also demonstrates the relationship between closure and openness. Its centre remains closed, while its periphery is open. The outer leaves may be spread widely, while the inner leaves retain their dense packing. This allows different degrees of unfolding to be observed simultaneously. Such a form is particularly valuable to the Matrix because it presents not a sequence of ‘before’ and ‘after’, but the coexistence of what is ‘still closed’, ‘in the process of unfolding’ and ‘already unfolded’. The succulent is a spatial model of time.

It may be said that time is arranged in layers within the succulent. The young Is located closer to the centre and the mature closer to the periphery. The outer edge is not merely a boundary, but an archive of previous growth. The inner centre is not merely a beginning, but the source of future layers. Between them lies a transitional zone. The succulent rosette may therefore be read as a temporal map: from the new centre towards the ageing periphery, and from potentiality towards openness.

The edge of the succulent leaf also possesses particular significance. It may be smooth, pointed, coloured, thickened or waxy, and may sometimes possess small serrations or spines. In many succulents, the leaf tips have a more vivid colour, such as a pink, reddish or purple hue. These edges and tips create an additional rhythm within the rosette. They emphasise the position of each module and make the layered structure more legible. Here, the edge records the individuality of each leaf within the overall order.

The edge of a succulent leaf differs from that of a thin leaf. It is often denser, rounded, protected and sometimes almost sculptural. This is connected with the thickness of the tissue and the storage of moisture. The succulent therefore demonstrates that the edge may be not only a line, but also a three-dimensional transition. In an ordinary leaf, the edge completes a thin plane. In the succulent, it completes a fleshy volume. This broadens the concept of the active periphery: the periphery may be thin, undulating or serrated, but it may also be dense, rounded and protective.

The surface of a succulent leaf is likewise important. It is often covered with a waxy coating, has a soft matt texture, and may appear powdered or velvety. Such a surface helps the plant to retain moisture and protect itself from excessive evaporation. Morphologically, it makes the leaf not merely a module of form, but also a functional outer covering. In the succulent, the surface is a protective boundary rather than solely a plane of exchange. This distinguishes it from an ordinary leaf, whose surface primarily facilitates active photosynthetic exchange.

The succulent rosette therefore demonstrates another mode of relationship with the environment. An ordinary leaf unfolds for exchange by increasing its area. A succulent frequently tends towards compactness, moisture retention, the reduction of loss and dense packing. Its form is open, but not profligate. It opens only as far as is compatible with preservation. The succulent may therefore be regarded as a model of restrained unfolding. Here, the Matrix operates not through the maximum expansion of surface area, but through a balance between openness and protection.

This balance is particularly important for understanding the biological variability of the Matrix. Not all plant forms tend towards the same type of unfolding. The leaf of a thin-leaved plant unfolds as a plane; the flower as a reproductive composition; the fern as a fractal frond; and the succulent as a dense rosette. Each form solves its particular task within its particular environment. The universal invariants of the Matrix therefore do not eliminate ecological diversity. They manifest themselves through different strategies.

The succulent rosette is also connected with the geometry of the circle. Viewed from above, it often forms an almost circular configuration. This circle, however, is not a simple contour. It arises from numerous leaves layered over one another and displaced spirally. Its external circular integrity results from its internal modularity. This is an important distinction: the circle of the succulent is not drawn externally, but constructed from within. It arises through growth.

Such a circle may be called a living circle. It is not perfect, mathematically exact or absolutely symmetrical. Its edges may be slightly uneven, its leaves may differ, its centre may be displaced, and some of its elements may be damaged or altered by the environment. Yet its overall circular organisation is preserved. This makes the succulent a good example of natural symmetry: sufficiently clear to remain legible and sufficiently variable to remain alive.

The spiral displacement of the leaves makes this circular form dynamic. When a succulent is examined closely, the eye often begins to move in a spiral from the centre towards the periphery or from the periphery towards the centre. This movement is not imposed by an external ornament; it arises from the arrangement of the leaves. The succulent rosette is therefore simultaneously a form of repose and a form of movement. It is externally static, but its structure indicates a sequence of growth.

This relationship between repose and movement makes the succulent particularly expressive for the philosophy of form. It appears stable, compact and almost crystalline. Yet its layers reveal gradual development. It appears to be a completed rosette, while its centre continues to grow. It preserves its form while constantly renewing it. In this sense, the succulent is a model of stable becoming. Within it, the Matrix manifests itself as an order preserved through the continuous addition of the new.

The succulent also allows us to consider the relationship between the internal and external. The inner leaves are often partly concealed by the outer ones. To perceive the complete structure of growth, one must look into the centre, between the layers and at their overlaps. The external surface does not immediately reveal the full depth. The rosette possesses an internal space, although that space is not always open. The succulent therefore demonstrates that an unfolded form may remain partly concealed. Multilayered organisation creates depth and protection.

This distinguishes the succulent from the flat leaf. The leaf primarily opens its surface outwards. The succulent constructs a surface through overlapping volumes. It is closer to the bud and fruit in its principle of preservation, but closer to the flower in its radiality. It combines several types

considered previously: the closure of the bud, the radiality of the flower, the layering of the fruit, the modularity of the seed-bearing structure and the soft surface of the leaf. The succulent is therefore an important synthetic object within the chapter.

The relationship between part and whole is also clearly visible in the succulent. An individual leaf may be studied as a form in its own right: it possesses a base, apex, surface, edge, thickness, colour and the function of storing water. Its full significance, however, becomes apparent only within the rosette. The leaf occupies a particular layer and angle, with a particular displacement in relation to adjacent leaves. It is a module of the overall order. The succulent therefore demonstrates that a part may be morphologically autonomous while remaining functionally systemic.

The succulent rosette is also a useful model of gradual increase in scale. The small inner leaves form a small rosette; the middle leaves enlarge it; and the outer leaves form the larger contour. Growth proceeds through the addition of new modules at the centre and the displacement of older modules towards the periphery. This creates a hierarchy of scale, although one that differs from the hierarchy of the fern. In the fern, the hierarchy branches; in the succulent, the hierarchy is layered. These represent two different types of natural order.

The layered hierarchy of the succulent may be described as concentric, but with an important qualification: its layers are not perfectly circular rings. They consist of individual leaves displaced spirally. It is therefore more accurate to speak of a spiral-concentric structure. This structure combines circular integrity with progressive displacement. It is precisely this that makes the succulent particularly expressive: it is simultaneously a circle, a spiral, a layer and a modular system.

Several parameters may be distinguished when analysing the succulent. The first is the centre of the rosette and the degree of its closure. The second is the number and arrangement of layers. The third is the spiral displacement of the leaves. The fourth is the modularity of the individual leaves. The fifth is the difference between the inner and outer leaves. The sixth is the form of the edges and tips. The seventh is the surface and texture of the leaves. The eighth is the degree of overall symmetry and individual variability. The ninth is the relationship between form and the function of water conservation. These parameters allow the succulent to be described rigorously as a model of the Matrix rather than solely in visual terms.

Such analysis is particularly important when working with illustrations. An image of the succulent viewed from above should reveal its centre, layers and spiral displacement. An oblique view may demonstrate its three-dimensional character and the overlapping of its leaves. A close-up of an individual leaf may reveal its surface, edge, thickness and colour transition. A comparative diagram may show the young inner leaves, the unfolding middle leaves and the mature outer leaves. Such a set of illustrations would reveal the succulent as a process rather than merely as an attractive rosette.

Three types of images are particularly important for the illustrations accompanying this section: first, a top view of a succulent rosette in which the centre and spiral-radial organisation of the leaves are legible (*Fig. 7*); second, a lateral or oblique view demonstrating the layering, overlapping and three-dimensional structure of the rosette (*Fig. 8*); and third, a close-up of a leaf module revealing its thickness, surface, edge, coloured tip and water-storing tissue (*Fig. 9*). Together, these images would present the succulent as a model of layered symmetry.

The succulent may also be compared with other structures of the Matrix, but only cautiously. Its rosette may resemble a flower, mandala, galactic spiral, architectural dome or ornamental rosette. These similarities, however, should be considered at the level of morphological correspondences: centre, layers, spiral displacement, modularity and edge. It cannot be claimed that all these forms possess a single mechanism. The succulent is a biological model, not universal proof.

It is particularly important not to confuse the succulent with the flower. Outwardly, some succulents genuinely resemble floral rosettes. Biologically, however, their rosettes are often formed from leaves rather than petals. When discussing the succulent, it must therefore be emphasised that it is not a flower in the strict sense, but a modular leaf structure morphologically displaying flower-like centred organisation and layering. This distinction is important for scientific accuracy.

The succulent also demonstrates that the Matrix may manifest itself in a form possessing prolonged stability rather than solely in a brief moment of unfolding. A flower frequently exists as a relatively short-lived phase. A succulent rosette may persist for an extended period while gradually renewing itself. Its unfolding is not a singular event, but becomes a permanent mode of growth. This broadens our understanding of the Matrix: unfolding may be event-like, as it is in the flower, or prolonged, as it is in the rosette.

The prolonged unfolding of the succulent is connected with its ecological strategy. It does not seek to spread out a large, thin surface rapidly. It accumulates, retains, compacts and protects. Its form is therefore slower, denser and more concentrated. In philosophical terms, the succulent demonstrates that development is not always connected with rapid expansion. It may instead manifest itself as the sustained preservation of a structure through the gradual accumulation of layers.

This makes the succulent an important contrast to the fern. The fern unfolds into a light, branching, fractal frond. The succulent forms a dense, water-storing, centred rosette. Both demonstrate self-similarity and order, but in different ways. The fern does so through branching and progressive reduction; the succulent through layers and spiral displacement. Together, they demonstrate that fractal botany does not possess a single type of form. It encompasses different strategies for organising living space.

The succulent also helps us understand the relationship between the Matrix and resilience. Its form is resilient because of its compactness, the density of its leaves, the distribution of mass, its water-storing tissue and protective surface. Here, symmetry is not merely beautiful, but functional. The rosette enables leaves to be distributed evenly around the centre, reduces excessive exposure, preserves moisture and protects the growth centre. The layered symmetry of the succulent is therefore a form of resilient existence.

Resilience does not imply immobility. The succulent grows, renews its leaves and may form new rosettes, flower stalks or lateral shoots. Its form may change while preserving its general principle. This is another example of an invariant expressed through variation. The rosette retains its type of organisation, while individual leaves age, new ones emerge, outer leaves may sustain damage, and the centre continues to develop. The Matrix manifests itself as the preservation of structure through change.

The succulent rosette may also generate new local centres. Some succulents produce lateral rosettes or daughter shoots. One centred structure then creates other centred structures. This

represents another form of the transition from one centre to multiple centres, already considered in relation to seeds and fruits. Here, however, the multiplicity may be vegetative and connected with the growth of rosettes rather than solely with seeds. This demonstrates that the biological Matrix possesses different means of reproducing centred forms.

The focus of this section must remain upon the morphology of the rosette, but this point may nevertheless be noted: the succulent is capable of demonstrating not only the layered symmetry of one centre, but also the formation of new centres. If the rosette produces lateral offshoots, a system of rosettes emerges in which each repeats the general principle. This brings the succulent closer to networked and fractal logic: a centre produces centres, and a module produces a modular system.

The succulent is also significant for understanding the protective beauty of form. Its leaves are frequently dense and smooth, sometimes covered with a bloom and coloured at the edges. The visual attractiveness of the succulent is connected with its protective and water-conserving properties. What is perceived as a decorative surface constitutes part of its biological adaptation. This once again demonstrates that beauty and function are frequently connected within living form, although they are not identical. Beauty may be the visible expression of functional order.

Philosophically, the succulent expresses the idea of preserved unfolding. It is open as a rosette, yet closed as a dense system. It expands while preserving compactness. It possesses a centre without losing its periphery. It forms layers without disintegrating into chaos. It repeats modules while preserving the individuality of each leaf. In this sense, the succulent is one of the most integrated botanical models of the Matrix: it combines centre, circle, spiral, layer, module, edge, surface, protection and growth.

The succulent also demonstrates that the Matrix may be interpreted as a balance of opposites. Centre and periphery, openness and closure, symmetry and variation, density and growth, protection and exchange, repetition and individuality—all these pairs are present within the succulent rosette. This is precisely what makes it so expressive. It cannot be reduced to a single geometric figure, but constitutes a living system of relationships. The Matrix manifests itself not in form as silhouette, but in the relationships among its elements.

If the fern teaches us to perceive repetition across scales, the succulent teaches us to perceive layered time. The young inner leaves, the unfolding middle leaves and the mature outer leaves exist within a single structure. The rosette does not narrate its history sequentially, as does the cycle seed—shoot—plant—flower—fruit. It presents its history simultaneously through the arrangement of its layers. This makes the succulent particularly important for visual thought: form becomes time arranged in space.

Thus, within the hypothesis of the Unified Matrix of the Universe, the succulent may be regarded as a model of layered symmetry. Its centre is an active zone of growth; its leaves are recurring modules; spiral displacement is a mode of spatial organisation; its layers are a record of time; its edge is the active periphery of each leaf; and its surface is a protective and water-conserving boundary. The succulent demonstrates how the Matrix may create a resilient, multilayered, centred and functional form.

The succulent rosette therefore demonstrates a distinctive type of plant order: neither the planar unfolding of the leaf nor the fractal branching of the fern, but spiral-layered unfolding around a centre. Within it, the new emerges internally, the mature moves towards the periphery, leaves form modules, modules combine into layers, and layers create living symmetry. Through the

succulent, it becomes clear that the botanical Matrix may manifest itself as a dense, protected and simultaneously unfolding structure in which form preserves water, time, growth and order within a single centred system.

11.4. Botanical Form and Universal Invariants

Botanical forms occupy a distinctive place within the hypothesis of the Unified Matrix of the Universe because morphogenesis is particularly visible within them. A plant does not merely possess form; it continuously generates, unfolds, restructures and reproduces it. The seed germinates, the leaf unfolds, the fern reveals a fractal frond, the succulent accumulates a layered rosette, the flower opens its centre, and the fruit contains numerous future seeds. Botanical material is therefore one of the clearest levels for an initial understanding of the Matrix as a process through which form comes into being.

This chapter has examined three key plant models: the leaf, the fern and the succulent. Each demonstrates a distinctive type of botanical organisation. The leaf demonstrates planar unfolding: its central vein establishes an axis, its lateral veins form a network, its blade creates an area of exchange, and its edge defines an active periphery. The fern demonstrates fractal self-similarity: the complete frond, lateral segment and small lobe repeat a similar logic of axis and branching. The succulent demonstrates layered symmetry: the centre, spiral displacement, modularity of the leaves and gradual unfolding from the inner core towards the outer edge.

These three forms differ, but allow common invariants to be identified. The first invariant is the centre or axis of organisation. In the leaf, this is the central vein; in the fern, the principal axis of the frond; and in the succulent, the centre of the rosette. The centre is not always a point; it may be a line, a zone of growth, an axis, an internal direction or a region of concentration. In every case, however, it performs the same function: it organises the form and establishes its subsequent unfolding.

The second invariant is the transition from unity to multiplicity. The central vein of the leaf produces lateral branches; the principal axis of the fern generates numerous segments; and the centre of the succulent creates numerous leaf modules. In each case, the form begins from an organising principle but does not remain in a state of unity. It unfolds into numerous parts. This multiplicity is not chaotic: it is connected with the centre, axis, rhythm, scale and function.

The third invariant is branching or modular repetition. In the leaf, it is expressed through venation; in the fern, through the hierarchy of frond, segments and lobes; and in the succulent, through the repetition of modular leaves around the centre. Branching and modularity are different means of constructing complexity. Branching transforms one line into a network. Modularity creates a multiplicity of recurring elements. Both principles enable form to become complex without losing coherence.

The fourth invariant is the edge. In the leaf, the edge completes the blade and indicates the limit of growth. In the fern, the edge is multiplied across numerous small lobes. In the succulent, the edge of each fleshy leaf emphasises the modularity and layered structure of the rosette. The edge is not merely an external contour. It demonstrates where internal organisation meets the environment. Through the edge, form interacts with air, light, moisture, time, damage and other external influences.

The fifth invariant is the surface. In botany, the surface is almost invariably functional. The leaf blade participates in photosynthesis and gas exchange. The fern frond creates a subdivided surface that increases the area of contact with the environment. The succulent leaf, by contrast, frequently tends not towards maximum unfolding, but towards the preservation of moisture through a dense surface, waxy coating and three-dimensional tissue. This demonstrates an important methodological proposition: the same invariant—the surface—may operate differently within different biological strategies.

The sixth invariant is layering. In the leaf, it may be manifested through tissue structure, upper and lower surfaces, levels of venation and zones of the blade. In the fern, layering is connected with levels of scale: frond, segment, small lobe and edge. In the succulent, layering is expressed most visibly: the young inner leaves, unfolding middle leaves and mature outer leaves form a visible temporal and spatial hierarchy. Layering demonstrates that form possesses depth even when it appears planar.

The seventh invariant is self-similarity. It is especially expressive within botanical forms. The leaf network repeats the principle of branching at different levels. The fern provides an almost textbook example of natural self-similarity. The succulent rosette demonstrates the repetition of centred form through layers and modules. Yet this self-similarity is not absolute mathematical recursion. It is finite and variable, and is connected with growth, function, species and environment. It is therefore more accurate to speak of natural self-similarity than of strict infinite fractality.

The eighth invariant is spirality. It may be explicit or concealed. In young fern fronds, the spiral appears in the curl from which the future structure unfolds. In succulents, spirality is visible in the displacement of leaves around the centre. In many leaf and seed-bearing structures, spirality is connected with growth, packing and the progressive arrangement of elements. The spiral demonstrates that form not only occupies space, but also bears the trace of time. It is one of the most important images of process rather than merely of geometry.

The ninth invariant is the relationship between form and function. Botanical material is particularly valuable because form is not merely a visual configuration within it. The leaf unfolds for exchange and photosynthesis. The fern organises a subdivided surface for growth. The succulent rosette preserves moisture and protects its centre. The flower participates in reproduction. The fruit organises seeds. The seed preserves the possibility of a new plant. Plant form therefore demonstrates that the Matrix in living nature is always material, functional and incorporated into an environment.

The tenth invariant is cyclicity. Plant form does not exist as a single completed image. It passes through stages: closure, unfolding, growth, maturity, ageing, reproduction and a new beginning. The leaf arises from a primordium, unfolds, functions, ages and enters a broader cycle of matter. The fern frond unfolds from a spiral state and passes through its own cycle. The succulent rosette continually produces new inner leaves, displacing older ones towards the periphery. Botanical form is always temporal, even when it appears stable.

These invariants help explain why plants provide primary visual material for the hypothesis of the Matrix. The centre, axis, branching, layer, edge, surface, spiral, self-similarity and cycle are all clearly visible within them. At the same time, plants do not require excessive abstraction: their morphogenesis can be observed, photographed, compared, described and analysed. Unlike cosmic structures, which require complex interpretation of data, or cultural symbols, which

require historical and hermeneutic analysis, botanical forms provide an immediate and materially concrete example of the unfolding of living form.

This does not mean, however, that botany ‘proves’ the universal Matrix in any definitive sense. Plant forms provide compelling material for constructing the model, but do not eliminate the need for testing, refinement and differentiation between levels. The leaf, fern and succulent demonstrate morphogenetic principles within living nature. When proceeding to geology, the cosmos or culture, however, it will be necessary in every instance to ask: Which features genuinely correspond? Which mechanisms differ? What level of analogy is permissible? Where does structural correspondence end and visual association begin?

The botanical level is particularly important as a discipline of observation. It teaches us to perceive not only the external silhouette, but also the internal organisation. In the leaf, one must perceive not merely a green form, but an axis, network, area and edge. In the fern, one must see not merely a beautiful pattern, but a multiscale hierarchy of self-similarity. In the succulent, one must see not merely a symmetrical rosette, but a centre, layers, spiral displacement, modularity, a protective surface and the temporal sequence of growth. This mode of interpretation may subsequently be transferred to other materials, but with greater rigour.

In this sense, botanical form represents the introductory level of the Matrix. It demonstrates how complex form should be examined: from centre to periphery, from axis to branches, from layer to surface, from edge to environment, from whole to part and from part to whole. It teaches us to observe scale: the complete leaf, vein, fine network and edge; the complete frond, segment and lobe; the complete rosette, layer and individual leaf. The Matrix becomes not merely a hypothesis about the world, but also a method of attentive morphological observation.

It is particularly important that botanical forms make it possible to combine visuality with processuality. They may be perceived as images, but cannot be understood solely as images. The leaf is a process of unfolding and exchange. The fern is a process of self-similar unfolding. The succulent is a process of layered growth and moisture preservation. The flower is a process of unfolding and reproduction. The seed is a process temporarily enfolded into a state of dormancy. Botany therefore demonstrates that form is a moment of process held in place rather than a static scheme.

This is why plant forms constitute the clearest visual material for an initial understanding of the Matrix. They combine visibility with vitality. Geometry, function, time and environment may all be perceived within them. The leaf vein is both a line and a channel. The fern lobe is both a part and a small whole. The succulent leaf is both a module and a water-storing structure. The flower is both beauty and a reproductive system. The fruit is both form and a multiplicity of future beginnings. The seed is both a small object and the beginning of a large cycle.

Botanical forms also make it possible to refine the very concept of the universal invariant. An invariant is not an identical figure recurring in every object. The leaf, fern and succulent do not resemble one another completely. Yet they demonstrate recurring relationships: centre and periphery, axis and branching, layer and unfolding, module and whole, edge and environment, part and scale, closure and openness. The universality of the Matrix should therefore be sought not in the identity of forms, but in the persistence of relationships.

This approach protects the hypothesis from oversimplification. It would be incorrect to claim that all forms in the world are leaves, flowers, spirals or fractals. It is far more accurate to say that different forms may manifest similar morphogenetic relationships. Plants provide clear examples

of these relationships, but do not exhaust them. They are a point of departure rather than a final explanation of everything. Botany functions here as the first level of the visible Matrix.

In proceeding to the geological level, it will be important to remember the lesson of the leaf: a surface possesses internal lines and edges. In proceeding to the cosmic level, it will be important to remember the lesson of the fern: self-similarity requires analysis of scale rather than merely visual resemblance. In proceeding to the cultural level, it will be important to remember the lesson of the succulent: symmetry may be layered, modular and temporal. Botanical forms therefore provide not only illustrations, but also methodological points of reference.

Botany also demonstrates the limits of interpretation. In plants, morphogenesis is a biological process. It is connected with cells, tissues, water, light, photosynthesis, heredity, growth regulation and ecological conditions. If similar forms occur in stone, a nebula or an artefact, this does not mean that the same biological mechanism operates within them. The similarity may be morphological, but its cause will be different. The botanical level must therefore remain strictly biological and must not become a source of direct transpositions.

At the same time, plants make it possible to see that morphological principles may be broader than any particular mechanism. Branching, self-similarity, layering, centred organisation, spirality and the active edge occur in different living forms because they solve fundamental organisational problems: distributing flows, increasing surface area, preserving the centre, organising multiplicity, connecting part and whole, and enabling interaction with the environment. These problems may possess analogues in other systems. Botany therefore opens the way to comparisons across levels, but requires caution.

The conclusion of the chapter may be expressed as follows: plant form is the most accessible school of the Matrix. The leaf teaches us to perceive planar unfolding, the fern self-similarity across scales, and the succulent layered, centred symmetry. Together, they demonstrate that biological form cannot be reduced to a single type of geometry. It may be axial, reticulate, fractal, rosette-like, spiral, layered, modular and cyclical. Yet the same general logic persists throughout these variations: concealed order unfolds into organised diversity.

For the illustrations accompanying the chapter, it is important to present not merely individual beautiful plants, but different types of morphological organisation. The leaf should be shown as an axial plane with veins and an edge. The fern should be shown as a self-similar system of levels. The succulent should be shown as a centred rosette of layers. The concluding illustration may juxtapose these three forms, demonstrating different botanical invariants of the Matrix: plane, fractal and rosette (*Fig. 10*). Such a comparison would help the reader see that the biological level of the Matrix is not uniform, but comprises multiple models.

The caption to this concluding illustration should be precise: ‘Three botanical models of the Matrix: the leaf as a plane of unfolding, the fern as natural self-similarity, and the succulent as layered symmetry.’ This formulation emphasises that the illustration concerns not proof of a universal law through external resemblance, but three different ways of organising living form. Presented in this manner, the illustration will become not a decorative conclusion, but an analytical diagram of the chapter.

Thus, within the hypothesis of the Unified Matrix of the Universe, botanical form serves as primary material for understanding universal invariants. Plants demonstrate how form arises from a centre or axis, unfolds into a surface, branches, creates a network, forms layers, repeats itself across different scales, activates its edge and enters into interaction with the environment. They

allow the Matrix to be understood not as an abstract idea, but as a concrete morphological logic of the living world.

The leaf, fern and succulent provide three complementary models of the biological manifestation of the Matrix. The leaf demonstrates the relationship between axis, branches, area and edge. The fern demonstrates natural self-similarity and hierarchy across scales. The succulent demonstrates a centre, spiral displacement, multilayered organisation and sustained unfolding. Taken together, these forms provide the clearest visual material for an initial understanding of the Matrix as a system of universal morphogenetic invariants manifested in living nature through growth, function, environment and time.

Fig. 1. Leaf with a Pronounced Central Vein: the Axis as the Basis of Planar Unfolding

Fig. 2. Close-Up of Leaf Venation: Primary, Secondary, and Fine Veins as a Map of Distribution

Fig. 3. Leaf Margin — Serrated, Wavy, or Lobed — as an Active Periphery of Growth and Interaction with the Environment

Fig. 4. Young Coiled Fern Frond: Spiral Folding of a Future Fractal Structure

Fig. 5. Mature Fern Frond: the Main Axis and Lateral Segments as the Basis of Natural Self-Similarity

Fig. 6. Scale Sequence “Frond — Lateral Segment — Small Division”: Repetition of One Morphological Logic at Different Levels

Fig. 7. Succulent Rosette Viewed from Above: Centre, Spiral Displacement, and Radial Arrangement of Leaf Modules

Fig. 8. Succulent Viewed at an Angle: Layered Overlap of Leaves and the Three-Dimensional Structure of the Rosette

Fig. 9. Close-Up of a Succulent Leaf: Thickness, Surface, Coloured Margin, and Water-Storing Tissue

Fig. 10. Three Botanical Models of the Matrix: the Leaf as a Plane of Unfolding, the Fern as Natural Self-Similarity, and the Succulent as Layered Symmetry

Fig. 11. Comparative Diagram of Universal Botanical Invariants: Centre/Axis, Branching, Layer, Margin, Surface, Self-Similarity, and Spirality

Part Four

The Geological and Lithomorphogenetic Level of the Matrix

Chapter Twelve

From an Inert Object to a Form of Slow Growth

12.1. From an Inert Object to a Form of Slow Growth

The transition from the botanical level of the Matrix to the geological level requires particular methodological caution. In plant forms, morphogenesis is evident: the seed germinates, the leaf unfolds, the flower opens, the fruit ripens, the fern demonstrates the self-similarity of growth, and the succulent accumulates layers around a centre. In stone, however, the process is concealed in a different way. Stone does not grow like a plant, undergo cellular development, pass through a life cycle in the biological sense or reproduce itself through a seed. It must therefore be clarified from the outset that, within the hypothesis of the Unified Matrix of the Universe, stone is considered not as a living organism, but as a morphogenetic body in the broad geological sense.

Such an understanding does not imply animating stone or transferring biological concepts to it without qualification. Stone remains a mineralogical, lithological and physicochemical object. Its structure is formed through other processes: crystallisation, sedimentation, pressure, heating, cooling, metamorphism, deformation, fracturing, dissolution, redeposition, weathering, erosion and other geological influences. These processes, however, leave visible traces within stone: layers, waves, folds, veins, inclusions, fractures, zones of crystal growth, lines of stress, colour transitions and textural patterns. Stone may therefore be interpreted as a form in which the prolonged history of matter has become a stable structure.

In ordinary perception, stone often appears to be an inert object. It lies in place, retains its mass, resists change and appears motionless. Yet this immobility is relative. Stone may be the outcome of processes that continued for thousands, millions or even hundreds of millions of years. What is perceived as immobility in human time constitutes a moment of stabilisation in geological time. Stone is not the absence of process, but the outcome of processes so slow that they lie beyond immediate human experience.

Stone may therefore be regarded as a form of slow growth. The word ‘growth’, however, must be used cautiously in this context. This is not biological growth associated with cellular division, metabolism and hereditary programming. It is geological form generation: the gradual accumulation of matter, crystal growth, the formation of layers, compaction of sediment, metamorphic transformation, propagation of fractures, formation of mineralised veins and deformation of rock under pressure. In this sense, stone may ‘grow’ as a structure, but not as an organism.

This broadened understanding of growth makes it possible to incorporate stone into the field of morphogenetic analysis. Whereas morphogenesis in biology denotes the development of the form of a living body, at the geological level it is possible to speak of the formation of a mineral body and its internal architecture. Stone becomes an object whose form arises not through a life cycle, but through a physicochemical and geodynamic history. Its morphology is not merely an

external covering, but a record of the processes that have operated within and around its constituent matter.

Within the hypothesis of the Matrix, stone is important because it reveals another type of time. A plant unfolds its form relatively quickly: a leaf may unfold over days or weeks, a flower over hours or days, and a fruit over a season. Stone, by contrast, forms in deep time. Its layers, folds, veins and textures may record prolonged and repeated influences. Stone therefore introduces the category of slow morphogenesis into the Matrix. It demonstrates that form may arise not only through the growth of a living organism, but also through the prolonged interaction of matter, pressure, temperature, water, minerals and movements of the Earth's crust.

Stone is particularly important because its form is frequently internal. The external form of a plant is usually readily visible: the leaf blade, flower, fruit, rosette or frond. In stone, a substantial part of morphogenesis is concealed within. Externally, a stone may appear to be a simple rounded or angular object, but a section, fracture, polished surface or natural crack may reveal a complex internal structure. Layers, rings, waves, veins, crystalline zones, inclusions and fields of colour may be visible within it. Stone frequently has to be opened for its morphogenetic history to become legible.

This distinguishes stone from the flower, but brings it closer to the fruit. Just as a fruit may conceal seeds and internal chambers, a stone may conceal layering and crystalline structures. The similarity, however, is morphological only. The fruit conceals living seeds and participates in biological reproduction. The stone conceals a mineralogical history and records geological processes. Function and form must therefore be distinguished in such comparisons. Stone may be a 'closed body' in the morphological sense, but it is not a 'fruit' in the biological sense.

The structure of stone is often perceived as a random pattern. On closer examination, however, many stone patterns prove to be traces of regular processes. Bands may be connected with stratification, variations in composition, sedimentation or metamorphic transformations. Undulating lines may record deformation, the bending of strata, movement of matter or stress. Veins may be traces of mineralised fractures through which solutions once passed. Crystalline zones may reflect the conditions under which minerals grew. Fractures may reveal the mechanical history of a rock. The pattern of a stone should therefore not be interpreted solely in aesthetic terms; it may constitute a morphogenetic document.

In this sense, stone is a body of memory. It preserves memory not in a conscious or biological sense, but as the physical memory of a process. Its structure retains traces of pressure, temperature, composition, water, time, deformation and destruction. Whereas the seed preserves the biological memory of a future plant, stone preserves the geological memory of previous states of matter. These are different types of memory, but both are important to the Matrix: form proves to be a bearer of time.

Stone also demonstrates that form may arise through resistance. In a plant, development is frequently connected with unfolding, growth and exchange. In stone, form often emerges through pressure, compression, faulting, friction, heating, cooling, dissolution or crystallisation within a confined space. A geological fold does not arise because matter 'seeks' to unfold, but because strata undergo deformation. A mineral vein does not arise as an organ of growth, but through the filling of a fracture by mineral-bearing solutions. A crystal grows according to its own physicochemical laws. Geological morphogenesis is therefore frequently a morphogenesis of stress.

This fundamentally broadens the concept of the Matrix. If attention were confined to the flower, leaf or fern, the Matrix might mistakenly be conceived solely as the harmonious unfolding of living form. Stone demonstrates that morphogenesis may be rigid, slow, stress-driven, disruptive and deformational. Form may arise not only through gentle unfolding, but also through pressure, bending, compression, fracture, crystallisation and subsequent stabilisation. The geological level is therefore necessary for a more complete model.

Stone also introduces the theme of the internal layer. In botany, a layer is frequently connected with tissue, a petal, a leaf module or the outer covering of a fruit. In stone, a layer is connected with the accumulation of matter, changing depositional conditions, metamorphism, mineralogical composition, pressure or deformation. Rock strata may be straight, undulating, ruptured, compressed, folded, displaced or intersected by veins. They demonstrate not only spatial structure, but also a sequence of events. Each layer may be the trace of a particular phase of formation.

The layering of stone is especially important to the hypothesis of the Matrix because it allows geological form to be perceived as a process recorded within a plane and volume. Stone may be read as a book without words: layer by layer, it records changes in environment, composition, pressure, temperature and movement. This metaphor must, of course, be used cautiously because geological interpretation requires specialised methods. Morphologically, however, stone may genuinely be considered as a body in which time has become structure.

Stone also demonstrates the relationship between the internal and external. The external form of a stone may result from weathering, abrasion by water, breakage, chipping, processing or natural erosion. Its internal form may result from crystallisation, stratification, veining or metamorphism. Sometimes the external surface reveals almost nothing about the internal structure. In other cases, the surface itself exposes a layer, fracture or undulation. Stone therefore requires a dual analysis: that of its external morphology and that of its internal texture.

This is important to the Matrix because form does not always coincide with contour. Stone teaches us to perceive deep form. The contour may be accidental or secondary, while the internal structure may be more significant. A small stone, for example, may possess a simple rounded exterior while containing a complex system of bands, waves and inclusions. In such a case, the morphogenetic body of the stone exists not only on its surface, but also within its section, fracture, texture and mineralogical structure.

Stone may also exhibit centred organisation. This is not always obvious, but some stone structures contain a nucleus, a centre of crystallisation, concentric zones, ring-shaped formations or inclusions around which subsequent layers are organised. In other cases, no centre is expressed, and the form is organised through the direction of a layer, an axis of deformation or a fracture line. The geological level therefore broadens the concept of the centre: a centre may be a point of crystallisation, the nucleus of an inclusion, a zone of pressure, the axis of a fold, a fault line or the direction of a flow.

This broadening is important to the universal model. In botany, the centre is frequently connected with a living growth zone. In stone, the centre may be physicochemical or mechanical. A crystal may grow from a centre or from a surface. A concretion may form around a nucleus. A vein may develop along a fracture. A layer may extend across a depositional plane. At the level of stone, the Matrix therefore manifests itself not through a single type of centre, but through different forms of the organisation of matter.

Stone may also display fractal or self-similar features. Fractures may branch, veins may form networks, mineral patterns may recur at different scales, and fracture surfaces may possess complex relief. Caution is again necessary, however. Not every complex stone texture is a fractal. Not every branching fracture has the same significance as a leaf vein or fern branch. It is possible to speak of natural self-similarity or morphological complexity, but only after careful description of scale, recurrence and mechanism.

In comparison with the plant, stone demonstrates particularly clearly the distinction between living and non-living form. In a leaf, veins distribute substances and support living tissue. In stone, veins may result from the mineral filling of fractures. In the fern, self-similarity is connected with the growth of a leaf structure. In stone, branching fractures may be traces of mechanical stress. In the succulent, layers of leaves are associated with growth and water storage. In stone, layers may be sedimentary, metamorphic or crystallisation structures. Similar morphological features do not therefore eliminate differences in causation.

The geological part of the study must be constructed upon precisely this distinction. Stone does not prove the Matrix by ‘resembling’ a leaf, flower or nebula. It is important because it demonstrates that complex, organised, multilayered, undulating, spiral-like and reticulate structures may also arise in non-living matter. These structures possess their own physicochemical and geological causes. At the level of morphological language, however, they may be compared with other levels as manifestations of common invariants: layer, edge, fold, centre, axis, branching, self-similarity, stress and the stabilisation of form.

Stone is also especially important to the theme of the fold. In a plant, the fold is often associated with a folded leaf, bud, petal or surface that subsequently unfolds. In stone, a fold may result from the deformation of strata under pressure. A geological fold represents not the unfolding of soft tissue, but the bending and redistribution of solid or plastically deformable material. It may be recorded in rock as a wave, arc, loop, bend or complex line. The geological fold is therefore a morphological trace of stress and time.

Undulating forms within stone likewise require separate attention. They may be associated with sedimentary structures, deformation, flows, metamorphic banding, dissolution, crystallisation or subsequent erosion. Visually, they may resemble water waves, lines of plant growth or even cosmic filaments. Their geological nature, however, must be considered independently. Within the Matrix, the wave in stone is of interest as a stable morphological trace of a process rather than as a simple decorative analogy.

Stone also demonstrates that form may result not from one process, but from the superimposition of numerous processes. The same stone may initially have formed as sedimentary rock, subsequently undergone pressure, been intersected by a mineralised vein, fractured, weathered, abraded by water and eventually discovered by a human being. Its visible form may be the outcome of several stages. Stone is therefore not a single stage, but a complex biography of matter.

This concept of the biography of matter is particularly important to the philosophy of the Matrix. In biology, the biography of form is connected with the life cycle of an organism. In geology, the biography of form is connected with the history of material. Stone possesses a past, but that past is not life. It is a sequence of physicochemical and geodynamic changes. Stone may therefore be called a body of geological memory, but it cannot literally be called a living body. Such caution preserves the scientific boundary of the hypothesis.

Stone as a morphogenetic body also helps us understand the relationship between stability and change. Stone is stable in comparison with a plant, but it is not eternal. It may break down, fracture, dissolve, weather, be transported, become sediment and participate in the formation of new rocks. Its stability is relative and temporary. Stone is therefore not definitive immobility, but a temporarily stabilised form of a geological process.

This brings stone closer to the model of stage D. A mature stone structure may be understood as a stabilised form in which previous processes have become visible and relatively persistent. Yet this form may once again enter processes of destruction, transportation, sedimentation and new formation. Even stone may therefore be incorporated into a cycle, although this cycle differs from the biological one. Geological cyclicity is slow, material, seedless and inorganic, but it exists as a circulation of matter and forms.

Stone is also important because it demonstrates the extreme dependence of form upon conditions. Mineralogical composition, temperature, pressure, solution chemistry, cooling rate, the presence of voids, the direction of stresses, water, fractures and time all influence the structure of stone. Stone is therefore not an accidental piece of matter. Its form is the outcome of conditions. In this sense, it confirms a general principle of the Matrix: form does not arise from emptiness, but through the interaction of internal composition and external influences.

Stones containing visible internal waves, bands, rings, spirals or veins are particularly expressive. Such stones may be regarded as natural pages of lithomorphogenesis. Their patterns demonstrate that lines of movement, compression, growth and change may exist within a solid body. These lines are not, of course, ‘lines of life’ in the biological sense. They are, however, material traces of process. It is for precisely this reason that stone may be included in the study as an important visual and philosophical object.

The submitted images of stones may be used to demonstrate several types of stone morphology. The first comprises layered structures in which form is constructed through successive bands and levels. The second comprises undulating structures in which layers or veins bend, creating an impression of movement. The third comprises spiral-like or curled forms in which a line is organised around a centre or bend. The fourth comprises veined and reticulate structures in which minerals fill fractures or create internal lines. The fifth comprises crystalline structures in which order is manifested through facets, growth zones or internal symmetry.

These types should not be conflated into one simple category. Each may possess a different origin. At the level of morphological interpretation, however, they reveal that stone is not an amorphous mass. It may possess an internal architecture. This architecture is not always obvious, but becomes legible when observed appropriately. It is precisely this that makes it possible to speak of stone as a morphogenetic body.

This section must prepare the concept of ‘lithomorphogenesis’, which will be introduced in the following section. For the present, it may be said that stone requires a specialised language of description. Botanical concepts cannot be transferred to it directly. Certain general categories, however, remain useful: layer, fold, edge, fracture, centre, axis, surface, internal structure, stabilisation, deformation and memory of process. Lithomorphogenesis will denote not the biological growth of stone, but the morphogenetic interpretation of stone structures as the outcomes of prolonged formation.

Such a concept is needed precisely to avoid inaccuracy. To say simply that ‘stone grows’ may sound biologically incorrect. To describe stone as ‘a dead, inert object’ would obscure its

geological history. The concept of lithomorphogenesis makes it possible to adopt an intermediate position: stone is not alive, but it has been formed; it is not an organism, but a body of process; it is not a subject of development, but a material bearer of prolonged transformation.

Understood in this way, stone becomes an important stage in the expansion of the hypothesis of the Matrix. Following plant forms, in which unfolding, self-similarity and cyclicity are visible through living growth, stone demonstrates that the invariants of the Matrix may also manifest themselves in non-living matter—through different mechanisms, different rates and different types of memory. This expansion must not be arbitrary. It must be founded upon a strict differentiation of levels: the biological is not identical to the geological, but both levels may be described through the language of form.

Thus, the transition from an inert object to a form of slow growth signifies a change in the researcher's perspective. Stone ceases to be merely an object lying before the observer and becomes a trace of prolonged formation. Its external contour, internal texture, layers, veins, fractures, waves and folds begin to be interpreted as the outcomes of processes. Stone does not come alive in the biological sense, but reveals itself as a geological body of time.

Within the hypothesis of the Unified Matrix of the Universe, stone should therefore be regarded as a morphogenetic body of non-living nature. It records processes of pressure, stratification, crystallisation, deformation, fracturing, material flow and internal organisation. Its immobility represents the relative stabilisation of a prolonged process. Stone should consequently be understood neither as an empty inert mass nor as a living being. It is a form of slow geological becoming in which time, stress and matter have acquired a stable visible structure.

12.2. Lithomorphogenesis

To analyse stone structures within the hypothesis of the Unified Matrix of the Universe, it is necessary to introduce a specialised working concept: lithomorphogenesis. This should not be understood as an established and universally accepted term within classical geology in the strict disciplinary sense. In this book, it is used provisionally to denote the morphogenetic interpretation of stone and mineral structures. Its purpose is not to replace lithology, mineralogy, petrography or geomorphology, but to provide a language that allows stone to be considered as a form resulting from prolonged processes of material formation.

The word 'lithomorphogenesis' may be divided into three semantic elements: 'litho'—stone, mineral body or rock; 'morpho'—form; and 'genesis'—origin, becoming or formation. In this sense, lithomorphogenesis signifies the origin and formation of stone form. In the context of this study, however, the concern is not only the origin of stone as a geological object, but also how its external and internal structures record processes of pressure, stratification, crystallisation, deformation, fracturing, mineralisation, dissolution, transportation and stabilisation.

Lithomorphogenesis must be distinguished from biological morphogenesis. Biological morphogenesis is associated with the development of a living organism, cellular division, tissue differentiation, hereditary information, metabolism and interaction with the environment. Lithomorphogenesis possesses none of these characteristics. Stone is not an organism, does not possess a biological programme, has no organs, does not reproduce through seeds and does not

pass through a life cycle in the biological sense. The transposition of biological terminology to stone must therefore remain limited and methodologically controlled.

The distinction from biology does not, however, imply the absence of form, history or internal organisation. Stone is formed. Minerals crystallise. Sediments accumulate and become compacted. Rocks are deformed. Strata bend. Fractures propagate. Voids are filled with solutions. Surfaces are weathered. Crystals grow under particular conditions. All these processes create forms. Stone may consequently be considered as a body whose form arose not through life, but through a physicochemical and geological history.

In this sense, lithomorphogenesis is a concept that makes it possible to retain two aspects of stone simultaneously. On the one hand, stone is a non-living object governed by the laws of geology, mineralogy and physics. On the other, it is not an amorphous mass: its structure may be extremely complex, multilayered, undulating, reticulate, crystalline, veined, ring-shaped or folded. The lithomorphogenetic approach directs attention precisely towards this organisation of form.

The principal purpose of the concept of lithomorphogenesis is to make stone legible as a processual structure. When we view stone solely as an object, we perceive its mass, colour, hardness, surface and the form of the fragment. When we view it lithomorphogenetically, we begin to perceive layers, lines of stress, traces of crystallisation, curves, internal boundaries, growth zones, veins, fractures, colour transitions, rhythms and deformations. Stone ceases to be merely an object and becomes the outcome of a process of formation.

This approach is particularly important to the hypothesis of the Matrix because it allows the concept of morphogenesis to be extended beyond living nature without conflating the living and the non-living. In botany, the Matrix manifested itself through growth, unfolding, branching, layers, edges, surfaces, self-similarity and cycles. In stone, some of these invariants may manifest themselves differently: the layer as a geological sequence; the fold as an outcome of pressure; the vein as a filled fracture; the centre as a crystallisation nucleus or inclusion; the edge as a surface of fracture or weathering; self-similarity as a recurring fracture or crystalline structure; and the cycle as the transition of rock through destruction, transportation and renewed formation.

Lithomorphogenesis therefore does not constitute an assertion that stone ‘lives’ or ‘grows’ like a plant. It denotes something different: stone form possesses a history of formation, and this history may be described through morphological categories. Under this approach, stone is not an organism, but a geological body of process. Its form is not an accidental outer covering, but the outcome of interactions among matter, environment, time and stresses.

Several categories are particularly important in lithomorphogenetic analysis. The first category is matter. Stone always consists of a particular mineral material or assemblage of minerals. The form of stone is inseparable from its composition: different minerals crystallise differently and respond differently to pressure, temperature, water and destruction. The morphological analysis of stone must therefore take account of the fact that structure arises not within an empty abstraction, but within specific matter.

The second category comprises the conditions of formation. Stone may arise in a sedimentary, igneous, metamorphic, hydrothermal or other geological environment. Temperature, pressure, solutions, cooling rate, depth, time and tectonic influences all affect its structure. Lithomorphogenesis cannot therefore be reduced to external pattern. The same visual motif—

banding or undulation, for example—may have different causes. What matters is not only the visible feature, but also the possible mechanism through which it arose.

The third category is time. Stone form frequently develops across timescales that bear no comparison with ordinary human life. A leaf unfolds rapidly, a flower withers within a short period, and a fruit ripens during a season. Stone, by contrast, may record processes of deep time. Lithomorphogenesis is therefore invariably associated with a slow history. Stone is a form in which time does not visibly flow, but remains recorded in strata, fractures, crystals and deformations.

The fourth category is stress. Many stone forms arise not in a state of repose, but under the influence of pressure, compression, tension, bending, faulting, cooling or internal stress. Fractures, folds, faults, veins and undulating strata may all be connected with a history of stress within the material. In a plant, form frequently expresses growth and exchange; in stone, it often expresses resistance, compression and transformation. Lithomorphogenesis may therefore be described as the morphogenesis of slow stress.

The fifth category is the layer. The layer is one of the most expressive features of stone form. It may be sedimentary, metamorphic, mineralogical, chromatic or textural. Layering demonstrates sequence, rhythm, changing conditions, recurrence and accumulation. In stone, the layer often constitutes the geological equivalent of time. It does not resemble a petal or leaf in the biological sense, but morphologically it likewise demonstrates that form may be constructed through successive levels.

The sixth category comprises the fracture and the vein. A fracture is a rupture, but not necessarily only a form of destruction. It may become a channel for mineralised solutions that subsequently form a vein. The line of rupture then becomes the line of a new structure. In this sense, stone demonstrates that rupture may be not only the end of a form, but also the beginning of another. This is an important lithomorphogenetic principle: a disruption of integrity may become a pathway for internal restructuring.

The seventh category is crystallisation. The crystal is one of the clearest examples of non-living order. Its form is connected with the internal structure of matter and the conditions of its growth. Crystallisation demonstrates that order may arise within non-living matter without a biological organism. Within the Matrix, the crystal is particularly important as an example of geometric organisation not belonging exclusively to life. The crystal nevertheless requires separate caution: its symmetry and growth obey their own physicochemical laws and must not be conflated with plant morphogenesis.

The eighth category is the surface. The surface of stone may result from fracture, polishing, weathering, erosion, abrasion by water, human processing or natural exposure. The surface may reveal the internal structure or, conversely, conceal it. In some cases, only a section allows the lithomorphogenetic organisation to be observed. The surface of stone is therefore not merely an external contour, but the boundary between a concealed history and a visible image.

The ninth category is stabilisation. Stone is frequently a stabilised form of process. Movement, pressure, flow or crystallisation have acquired a relatively stable outcome within it. This stability, however, is not absolute. Stone may break down, fracture, dissolve, weather, become sediment and subsequently form part of a new rock. Lithomorphogenesis therefore includes not only formation, but also subsequent changes in form.

These categories allow stone to be described as a distinctive type of morphogenetic body. In biology, a morphogenetic body lives, grows, functions and reproduces. In geology, a morphogenetic body forms, deforms, stabilises, breaks down and passes into other states of matter. The two levels differ, but both may be described through the process by which form comes into being. It is in this limited and precise sense that the concept of lithomorphogenesis becomes useful.

It is important to emphasise that lithomorphogenesis does not in itself prove the universality of the Matrix, but constitutes an analytical instrument. It makes it possible to ask questions of stone structure: Where is the centre or nucleus? Is there a layer? Is there a direction? How is the surface organised? Are there traces of pressure or deformation? How are the veins distributed? Is there a recurring pattern? Where is the edge? What is concealed within? What processes may have formed the visible structure? These questions move observation from the realm of impression into that of morphological description.

Without such an instrument, it is easy to fall into the trap of visual association. A stone may resemble a flower, wave, eye, tree, cloud, nebula, spiral or living creature. Resemblance in external appearance, however, does not in itself imply morphogenetic correspondence. The lithomorphogenetic approach requires us not to stop at an impression, but to analyse specific features: layers, lines, deformations, fractures, crystals, growth zones, colour transitions, symmetry, recurrence and scale. Only then does stone become material for the hypothesis rather than an object of unrestricted fantasy.

In this respect, lithomorphogenesis performs a disciplinary function. It prevents any visually attractive stone pattern from being arbitrarily declared a manifestation of the Matrix. On the contrary, it requires the structure to be described. If a wave is visible within a stone, one must ask whether it represents the bending of a layer, a trace of flow, the result of deformation, a crystallisation zone or an incidental surface pattern. If a spiral is visible, one must ask whether it is an actual structural line, an inclusion, a fracture surface, a vein, a fossil, a mineralogical pattern or merely a visual association. If layering is visible, its character and direction must be determined.

This approach is especially important when working with the submitted images of stones. They may be exceptionally expressive visually, but the book must preserve scientific and philosophical precision. Captions to the images should therefore remain cautious: ‘stone with undulating layering’; ‘stone with veins and internal lines of stress’; ‘stone structure with ring-shaped or spiral-like motifs’; ‘layered rock fragment as an example of the recording of a prolonged process’. It should not be claimed that a stone ‘proves the cosmic Matrix’ or ‘is a living seed’. It is preferable to say that it ‘may be considered as a morphological analogue’, ‘demonstrates a structural correspondence’ or ‘records a lithomorphogenetic motif’.

Lithomorphogenesis also allows stone to be connected with the A–B–C–D model, although not literally. In biology, A is the seed, B germination, C growth and differentiation, and D the mature form. In stone, these stages must be understood provisionally. A may be a crystallisation nucleus, initial sediment, a mineral inclusion, a zone of primary accumulation or the initial integrity of the material. B may be the first disruption of homogeneity: a fracture, the beginning of a layer, crystal growth, an initial vein or a direction of pressure. C may be complexification: stratification, deformation, branching of veins, growth of a crystalline structure or folding. D may be a stabilised stone form visible in section, on a surface or within a fragment. A new A may arise through destruction, transportation and the incorporation of matter into a new cycle.

This application of the A–B–C–D model must be cautious and analytical. Stone does not pass through stages in the manner of an organism. Its structure may, however, be reconstructed as a sequence of states of matter. If a nucleus, layers around it and subsequent deformation are present, it is possible to speak provisionally of a sequence of formation. If a fracture has been filled with minerals, a transition from rupture to a new internal line may be observed. If there is a fold, one may identify the layer before deformation, the action of pressure and the stabilised bend. In every case, the model is used not as a dogma, but as a scheme for morphogenetic interpretation.

Lithomorphogenesis also helps us understand the significance of ‘slow unfolding’ in stone. In a plant, unfolding frequently means physical opening: a leaf spreads out, a flower opens and a fern unfolds its frond. In stone, unfolding may mean the revelation of a concealed structure through sectioning, fracture, erosion, weathering or exposure. Stone may form at depth and become visible only after the surrounding rock has been destroyed or through human intervention. Lithomorphogenetic unfolding is therefore often connected not with outward growth, but with the opening of the internal.

This is especially important for visual material. Many stones become morphologically expressive only after sectioning or polishing. Before this, their internal structure may remain invisible. An image of stone therefore often presents not only a natural form, but also the outcome of the method through which that form was revealed. A section is an act of revealing the stone’s internal Matrix. It does not create the structure, but makes it visible. Captions to illustrations may therefore distinguish among a ‘natural surface’, ‘fracture surface’, ‘section’, ‘polished surface’ and ‘exposed layer’.

In the lithomorphogenetic sense, stone may also be understood as a space of internal boundaries. In a plant, boundaries frequently separate tissues, organs, layers and surfaces. In stone, boundaries may lie between strata, minerals, phases of crystallisation, zones of pressure, fractures and inclusions. These boundaries may be sharp or gradual, straight or undulating, continuous or interrupted. They demonstrate that stone consists not only of matter, but also of relationships among different parts of that matter.

Colour boundaries are particularly expressive. Stone may possess bands of different colours, transitions from light to dark, concentric rings, patches and veins. These differences may be connected with mineralogical composition, impurities, conditions of formation, oxidation, inclusions or subsequent transformations. In lithomorphogenesis, colour is considered not only as an aesthetic feature, but also as a potential indicator of internal history. The chromatic form of stone may be a trace of process.

Lithomorphogenesis is also connected with the concept of ‘flow’, although caution is again required. In stone, flow may refer to the movement of magma, mineralised solution, sedimentary material, water, melt or plastically deformable matter. This is not the vital flow of a plant. Flow may nevertheless be recorded visually in lines, waves, bands, veins and elongated inclusions. It is therefore possible to speak of traces of flow in geological material where this corresponds to a plausible physical interpretation. The word ‘flow’ must not become a metaphor devoid of content.

Stone also contains the category of ‘compression’. Many stone forms arise through compaction, pressure, metamorphic transformation and the compression of strata. Compression may transform initially horizontal or unconsolidated structures into dense, undulating, folded or recrystallised forms. In this sense, stone demonstrates the reverse aspect of unfolding: form may

arise not through expansion, but through compression. At the geological level, the Matrix includes both compression and unfolding.

This is particularly important to the concept of ‘stone as frozen time’, which will be considered later. The compression of matter may simultaneously constitute the compression of time: a prolonged history becomes contained within a compact fragment of rock. A small stone may contain traces of vast geological processes. Just as the seed contains a future form within a small volume, stone may contain a past geological history within a small volume. The distinction must again be maintained: the seed contains the potential of a future living cycle, whereas stone contains the trace of past geological formation.

Lithomorphogenesis also allows us to speak of stone as an archive of stresses. Fractures, bends, folds, displacements, ruptures and zones of recrystallisation may record how the material responded to forces. In this respect, stone is particularly important for broadening the concept of memory. Biological memory is directed towards reproduction and development. Geological memory records an influence. Stone does not remember as an organism does, but its structure preserves traces of what has occurred. This is material memory without consciousness or life.

Such memory is highly significant to the hypothesis of the Matrix. It demonstrates that form may be a bearer of history in different modes. In a plant, history is expressed through growth. In stone, it is expressed through structural recording. In culture, it is expressed through symbols and artefacts. In the cosmos, it is expressed through the distribution of matter and radiation. Each level possesses its own type of memory. Lithomorphogenesis helps describe specifically the geological type: the memory of matter, pressure, temperature and time.

The lithomorphogenetic approach also creates the possibility of developing a typology of stone forms. Layered, folded, veined, fractured, crystalline, ring-shaped, undulating, dendritic, porous and clastic forms may be distinguished, as may polished sections and natural surfaces. Such a typology will not necessarily coincide with the geological classification of rocks because it is constructed according to morphological features. It may nevertheless be useful for comparative analysis of the Matrix.

It must be remembered, however, that a morphological typology does not replace a geological one. The same morphological type may occur in different rocks and arise for different reasons. Banding, for example, may be sedimentary, metamorphic or mineralogical. A fracture network may be associated with cooling, stress, desiccation or subsequent destruction. A lithomorphogenetic classification must therefore remain open and subject to refinement. It describes form, but does not always explain its origin conclusively.

For the purposes of this scientific and philosophical study, this is acceptable provided that the boundaries of the analysis are clearly identified. The purpose of the Matrix hypothesis is not to conduct a complete geological examination of every stone, but to demonstrate that stone structures may be incorporated into a broad morphogenetic language. This language must, however, respect geological complexity. The text should therefore use formulations such as: ‘may be interpreted as’, ‘morphologically resembles’, ‘records a feature’, ‘allows us to consider’, ‘requires geological clarification’ and ‘demonstrates at the structural level’. Such formulations preserve analytical precision.

Lithomorphogenesis also allows stone to be reconsidered as a boundary between chaos and order. On the one hand, stone may appear to be an accidental fragment. On the other, it may contain precise crystals, rhythmic layers, regular veins, recurring fractures, rings or waves. Stone

frequently combines the contingency of external destruction with the regularity of internal formation. This combination is particularly interesting to the Matrix because it demonstrates that order may be partial, local, concealed and detectable only through attentive observation.

In this respect, stone differs from an ideal geometric figure. Its form is rarely absolutely symmetrical. It may be damaged, incomplete, fractured and heterogeneous. Yet it is precisely through this incompleteness that its actual history becomes visible. Stone does not depict an idea of form; it bears traces of processes. Lithomorphogenetic analysis must therefore value not only regularity, but also deformation. A wave, fracture, rupture, displacement and erosion are not errors of form, but geological evidence of it.

Lithomorphogenesis is also connected with the problem of scale. Stone may be considered as a small rock fragment, part of a cliff, part of a geological stratum, an element of a mountain massif or part of the Earth's crust. One small stone may contain a structure that once extended through a much larger body of rock, but was subsequently separated, broken away, transported and abraded. Stone is therefore always connected with a larger geological context. Its morphology may be a local part of a greater form.

This resembles the biological relationship between part and whole, but possesses a different meaning. A leaf is part of a plant and is connected with a living organism. A stone is a fragment of rock or a geological body, but its separation may result from destruction, erosion, transportation or human action. In both cases, the part may retain features of the whole. The biological and geological relationships, however, differ. Lithomorphogenesis allows them to be compared at the level of form without conflating their natures.

Stone may also be considered as an object in which the internal and external exchange places. What was once located deep within a body of rock may appear at the surface following fracture or polishing. What was once a concealed layer becomes a visible pattern. What was once a fracture becomes a mineral vein and subsequently a decorative line. This transformation of the concealed into the visible is particularly important to the Matrix. At the geological level, unfolding frequently occurs through the exposure of the past.

Lithomorphogenesis is therefore connected with a hermeneutics of the surface. The surface of stone must be interpreted not only as an external appearance, but also as a manifestation of the internal. Such interpretation must not, however, be arbitrary. It requires knowledge of processes, caution and a willingness to acknowledge uncertainty. From a single image, it is sometimes impossible to determine precisely how a structure arose. In such cases, one should speak not of a proven mechanism, but of a morphological feature: layering, undulation, veining, fracturing, a ring-shaped motif or a crystalline structure.

In this sense, lithomorphogenesis may become a bridge between visual analysis and geological science. It begins with the image, but must not end with the image. It leads to questions about the origin of form. Why does a line bend? Why does a layer recur? Why does the colour change? Why does a fracture branch? Why does a crystal possess a facet? Why has a surface been abraded? These questions make stone an object of investigation rather than merely one of aesthetic contemplation.

Lithomorphogenesis also helps us understand why stones are frequently perceived as mysterious objects. Their forms can indeed be extraordinarily expressive. Within a single stone, one may perceive waves, landscapes, trees, clouds, internal worlds and lines of movement. A scientific and philosophical approach, however, requires figurative human perception to be

distinguished from the structure of the object itself. Stone may evoke associations, but the more important task in this book is to demonstrate which actual morphological features underlie them.

Two levels of language should therefore be used in the analysis of stones. The first is descriptive: colour, layer, line, fracture, vein, wave, fold, crystal, surface and contour. The second is interpretative: memory of process, recording of stress, trace of flow, stabilisation of form, internal unfolding and slow becoming. The first level must precede the second. One cannot begin with philosophical meaning without first describing the structure. Lithomorphogenesis requires a movement from observation towards interpretation.

In this respect, the geological part of the study may become particularly compelling. It will demonstrate that the hypothesis of the Matrix is not limited to aesthetically attractive living forms. Stone, a heavier and more silent object, likewise contains a complex order. This order, however, is different: it is neither floral, foliar nor seminal, but lithic. It must be interpreted within another temporality, through other processes and within a different materiality. This is precisely why the concept of lithomorphogenesis is necessary.

Lithomorphogenesis also makes it possible to preserve a balance between science and philosophy. Scientific rigour requires acknowledgement of geological mechanisms and the limitations of interpretation. Philosophy allows stone to be perceived as a form of time, stress, memory and stabilisation. Without scientific rigour, stone would become a mystical sign. Without philosophy, it would remain merely a rock specimen. The lithomorphogenetic approach maintains an intermediate level: stone as a material object open to morphological and semantic interpretation.

Thus, in this book, lithomorphogenesis denotes the morphogenetic interpretation of stone structures as the outcomes of prolonged formation, deformation and stabilisation of matter. It does not attribute biological life to stone, but recognises within it a history of form. It does not replace geology, but creates a language for comparative analysis. It does not claim a direct identity among stone, plant and cosmos, but allows common structural invariants to be identified at different levels of nature.

The concept of lithomorphogenesis is therefore necessary for the accurate incorporation of stone into the hypothesis of the Unified Matrix of the Universe. Stone is regarded as a non-living morphogenetic body in which processes of pressure, stratification, crystallisation, deformation, fracturing, mineralisation and weathering become visible structure. Lithomorphogenesis is the language of slow stone becoming, allowing stone to be read not merely as inert mass, but also as a material record of deep time.

12.3. Waves, Layers and Folds in Stone

Stone becomes particularly expressive when its internal structure is made visible through layers, waves, folds, veins and colour transitions. Such forms are frequently perceived as natural patterns, but they possess a deeper significance for lithomorphogenetic analysis. They demonstrate that a stone body is not a homogeneous and silent mass. It may contain a record of a prolonged history of pressure, movement of matter, deformation, accumulation, crystallisation and the subsequent revelation of structure at the surface or in section.

Waves, layers and folds in stone should be considered not as accidental decoration, but as possible morphological traces of process. It is not always possible, of course, to determine the geological origin of a particular line or curve precisely from its external appearance alone. A rigorous conclusion requires mineralogical, petrographic and geological analysis. At the morphological level, however, important features may be identified: the recurrence of bands, the direction of lines, curves, rhythm, ruptures, intersections, changes in colour, variations in density, the presence of veins and the internal organisation of the surface. It is these features that allow stone to be described as a lithomorphogenetic body.

The layer is one of the most readily comprehensible elements of stone form. In a plant, a layer may be a petal, tissue, row of leaves or outer covering of a fruit. In stone, the layer possesses a different nature. It may be connected with sedimentation, changes in composition, mineralogical banding, metamorphic transformation, pressure, temperature or successive phases in the formation of matter. In every case, however, the layer demonstrates that stone did not arise as a simple homogeneous mass. It was formed through distinctions, sequences and changing conditions.

Layered stone may be read as a structure of time. Each layer is not a date in the literal sense, but the trace of a particular state of formation. If the layers differ in colour, thickness, density or direction, this indicates differences in conditions. Stone appears to preserve an alternation of phases: one layer, another layer, a transition, compaction, deformation, fracture and new mineralisation. Layering is therefore one of the principal signs of the geological memory of form.

The layer also demonstrates that form may be constructed through accumulation. In biology, a plant grows through cellular processes and the formation of tissues and organs. In geology, accumulation may be sedimentary, mineralogical, crystallisational or metamorphic. In both cases, form does not appear instantaneously. It is assembled through a sequence. The mechanism of that sequence, however, differs. A layer in stone is not a living organ, but it is a structural level of matter that arose within a particular history.

Undulating forms in stone are especially important to the hypothesis of the Matrix because they render visible a movement recorded within an immobile object. Stone appears solid and static, yet its undulating lines may demonstrate that its matter was once involved in processes of bending, pressure, flow, sedimentation, compression or deformation. A wave in stone is not movement in the present, but a trace of movement in the past. It transforms time into a line.

This idea requires caution. Not every undulating line has the same meaning. In one case, it may be a trace of sedimentary rippling; in another, the outcome of metamorphic banding; in a third, a layer bent under pressure; in a fourth, a vein; and in a fifth, a feature of the mineralogical pattern. Within this study, it is therefore more accurate to speak not of a single mechanism of the ‘stone wave’, but of an undulating morphological motif that may possess different geological foundations. Here, the Matrix manifests itself not as an identical cause, but as a recurring type of form: curvature, rhythm, line, directionality and the recording of movement.

A wave in stone differs from a wave in water. Water moves, changes form, disappears and reappears. A stone wave is stable. It does not flow, but preserves the trace of something that may once have been connected with movement or deformation. The stone wave is therefore a paradoxical form: it represents movement through immobility. In this sense, it is especially important to the philosophy of lithomorphogenesis. Stone demonstrates that movement may be not only actual, but also frozen into structure.

The fold is an even more expressive feature. A fold in stone may arise through the deformation of strata when rock is subjected to pressure and bends without being completely destroyed. Such a fold reveals a history of stress within the material. If a layer was once relatively straight and subsequently became bent, its form must have undergone transformation. A geological fold is a record of force. It demonstrates that form was not merely accumulated, but was also transformed by pressure.

A fold in stone differs from a fold in a leaf or petal. In a plant, the fold is frequently connected with growth, protection and the subsequent opening of a surface. In stone, the fold is more often connected with the deformation of matter under pressure. At the morphological level, however, both folds demonstrate an important invariant: form may temporarily or permanently contain curvature, compression, internal depth and a relationship between the concealed and the visible. In a plant, the fold may open; in stone, it is more likely to stabilise and become a geological record.

In relation to the submitted stone forms, it is particularly important to demonstrate this duality: they may resemble waves, spirals, flows or folds, but the text should describe them as morphological structures recording possible processes within matter. If undulating bands are visible on the surface of a stone, the appropriate term is undulating layering. If the lines curl, one may speak of a spiral-like or curled motif. If bends and compressed bands are visible, one may speak of folded deformation or a folded pattern. If lines intersect, one may speak of a complex superimposition of structures.

Spiral-like forms in stone require particularly careful analysis. In biology, the spiral is frequently connected with growth, packing, unfolding or the arrangement of elements around a centre. In stone, a spiral-like motif may arise for other reasons: the form of an inclusion, the bending of a layer, the trace of a fossil, mineralisation, a fracture, a broken surface, polishing, an internal swirl within the pattern or an accidental intersection of lines. It cannot therefore be assumed automatically that a stone spiral possesses the same meaning as the spiral of a fern or succulent. It may nevertheless be considered as a morphological feature of organised curvature.

A spiral or curled line in stone is of interest because it combines centre and movement. Even when the centre is not explicitly defined, the eye perceives such a form as movement around an internal point or zone. This may be particularly expressive in stone because solid matter records something that visually resembles rotation or enfolding. Lithomorphogenetically, this may be described as a form in which the line does not simply proceed directly, but changes direction, bends, returns and creates internal tension. Such a motif must be recorded as a structure rather than interpreted as a mystical sign.

Waves and folds in stone also demonstrate the relationship between line and layer. A straight layer records a relative sequence. When a layer bends, it begins to demonstrate deformation. When a layer is ruptured, it demonstrates a loss of integrity. When a layer is intersected by a vein, it demonstrates the superimposition of a second process upon the first. A stone surface may therefore be complex not because it contains many lines, but because those lines belong to different phases of formation. One layer may have arisen earlier, the fracture later, mineralisation still later, and the surface may have been exposed later stfig. Stone is a body of superimposed temporalities.

This superimposition is particularly important to the idea of ‘frozen time’, which will be developed in the following section. It may already be said that stone records not a single moment, but a set of events. A layer may be older than a fracture; a vein may be younger than the layer; polishing may be younger than the internal structure; and the external contour may result from destruction

unrelated to the internal pattern. Stone should therefore not be read as a flat picture. It must be read as a multitemporal structure.

In the submitted images of stones, particular attention should be paid to how lines organise the surface. If the lines run parallel, one may speak of rhythmic layering. If they bend, one may speak of an undulating or folded structure. If they form rings or concentric motifs, one may speak of centred organisation. If they diverge or branch, one may speak of a network of veins or fractures. If they intersect, one may speak of the superimposition of processes. Such a typology will make the visual analysis more rigorous.

A stone wave may be compared with a plant fold, but only at the level of the morphological invariant. In both cases, one sees a curved line, a transition from straightness to curvature and a record of stress or unfolding. In the plant, however, the curvature is connected with living tissue, growth and function. In stone, it is connected with the geological state of matter. The appropriate formulation is therefore that the stone wave and plant fold may be regarded as different manifestations of the invariant of curvature, but they belong to different mechanisms of morphogenesis.

The same applies to the layer. A layer of petals within a flower, a layer of leaves within a succulent and a layer within stone are not the same phenomenon. They nevertheless demonstrate a common structural category: form may be constructed through successive levels. In the flower, a layer may unfold as a petal; in the succulent, a layer is expressed through a row of leaves; in the fruit, a layer protects the seeds; and in stone, a layer records a geological sequence. The layer is therefore a universal morphological invariant, but its nature differs at different levels.

Geological folds are particularly important as examples of forms arising through pressure. Pressure does not merely destroy; it also forms. It may bend strata, compact matter, create new textures and change the direction of internal lines. Stone thus demonstrates that the Matrix operates not only through unfolding, but also through compression. Compression may be productive when it creates a new organised structure. A geological fold is precisely such a structure: it demonstrates how stress becomes form.

Undulating and folded stone structures may also be read as traces of the plasticity of the solid. Stone appears absolutely hard, but geological conditions may cause rocks to behave differently: to bend, deform, recrystallise and alter their internal structures. Stone is hard to the human hand, but under geological time and pressure it may be a transformable body. This is an important philosophical point: hardness depends upon the scale of time and force. What appears motionless may form part of an extremely slow movement.

In this sense, stone helps to broaden the concept of movement. Movement is not always visible as displacement. It may be recorded as the curvature of a layer, the direction of a vein, a fracture, a displacement, a colour transition or a change in grain size. Lithomorphogenesis teaches us to perceive movement in its traces. Stone does not move before us, but its structure may testify to movements that have already ended or stabilised. Stone is therefore not the opposite of process, but its archive.

Waves, layers and folds in stone also demonstrate the relationship between internal and external edges. A layer possesses a boundary. A fold possesses inner and outer radii of curvature. A vein has margins separating it from the host rock. A fracture has walls. A polished surface has an external contour. Stone contains numerous edges. They do not always coincide with the external

boundary of the object. Internal edges may be more significant than the external contour. This makes it possible to speak of stone as a system of internal boundaries.

The internal boundaries of stone are particularly expressive in section. A polished surface may reveal lines invisible from the exterior. A fracture may expose layering. A break may reveal a crystalline nucleus. Lithomorphogenetic analysis therefore requires not only natural stones in their external form, but also sections, thin sections, cut faces, fracture surfaces and polished surfaces. These reveal the concealed architecture of matter. In this sense, a section through stone serves as a window into its past.

A section also introduces the human factor. If a stone has been sawn and polished, the image we see results from an interaction between the natural structure and the human method through which it was revealed. This does not make the image false, but it requires acknowledgement. Nature created the internal structure; a human being exposed it along a particular plane. It is therefore useful for captions to distinguish among a natural surface, fracture surface, section and polished surface. This increases the accuracy of the visual material.

Waves, layers and folds in stone may form highly complex compositions. At times, the layers resemble landscapes, mountains, clouds, sea waves, tree rings or even living tissues. Such associations are natural, but must be used cautiously. In the book, structure must not be replaced by image. If a stone resembles a landscape, this may be noted as a visual association, but the principal description must remain lithomorphogenetic: banding, undulation, colour transitions, layer line, zone of pressure, vein and rupture.

Stone forms in which a line appears to move are particularly powerful. An undulating line, smooth curve, spiral, loop or curl creates an impression of internal dynamics. Within stone, this impression is connected with a paradox: dynamics are visible in immobility. This is why such stones may provide important illustrations of the Matrix. They demonstrate not merely a beautiful pattern, but the possibility that form can preserve a process. Stone becomes visual evidence that movement may cease without disappearing as a trace.

Layered stone structures are also important for understanding memory. Whereas memory within a plant is connected with future potentiality, memory within stone is directed towards the past. A layer does not prepare a new leaf or flower. It preserves the trace of a former state. Geological memory therefore differs from biological memory. It does not reproduce an organism, but records the history of a material. This distinction must be emphasised: stone is not a seed in the biological sense, but it may be a repository of the past, just as the seed is a repository of the future. Both are compact bearers of time, but the direction of that time differs.

A geological fold also demonstrates that time may be not only sequential, but deformational. A layer first formed and was subsequently bent. As a result, two temporal phases are present within a single image: the time of accumulation and the time of pressure. If a fracture or vein appeared later, a third phase emerges. If the stone was subsequently abraded or polished, a fourth phase appears. Stone form may therefore be multilayered not only physically, but also historically. It contains several temporalities.

Such multitemporality is an important element of lithomorphogenesis. In botany, a cycle may often be presented as a sequence of stages. In stone, the sequence may be more complex and not always obvious. Some processes are superimposed upon others, some erase traces of what preceded them, and some reveal those traces anew. Stone therefore requires a reconstructive mode of observation. Lithomorphogenetic interpretation invariably entails asking: What might

have occurred earlier? What occurred later? What was superimposed? What was destroyed? What was preserved?

Waves and folds in stone also allow the category of rhythm to be discussed. Layers may recur with a particular periodicity or irregularity. Waves may possess different amplitudes. Bands may be narrow and frequent or broad and infrequent. Fractures may form a reticulate rhythm. The rhythm of stone is not musical, but structural. It demonstrates an alternation of elements. Rhythm may result from successive deposition, changing conditions, mechanical deformation or mineral growth.

Rhythm is particularly important for connecting stone with the universal invariants of the Matrix. In botany, rhythm is visible in leaves, petals, seeds, fern segments and the layers of succulents. In stone, rhythm is visible in bands, strata, fractures and crystalline zones. What they share is not a mechanism, but structural recurrence. Rhythm makes form legible. Without rhythm, stone would be a chaotic mass; with rhythm, it becomes an organised surface or body.

Undulating layering may be regarded as one of the most expressive lithomorphogenetic motifs. It combines layer, movement, pressure and rhythm. Straight layering demonstrates sequence. Undulating layering demonstrates a sequence subjected to deformation. If the wave recurs, rhythmic folding arises. If it is complicated by veins, a multiprocess structure emerges. Such stones are particularly useful for illustrating the geological level of the Matrix because they reveal not only the presence of layers, but also their transformation.

Folds may also vary in their degree of expression. A fold may be gentle, smooth and scarcely perceptible; it may be sharp, compressed and almost broken; it may be complex and repeatedly curved; or it may be disrupted by fractures. The degree of folding indicates the intensity or character of deformation, although precise interpretation requires geological analysis. Morphologically, however, it is possible to record the form of the curvature, its direction, recurrence, ruptures and relationship with the layers.

Veins in stone may intensify the impression of a wave or fold. They may follow a layer, intersect it, form a network or stand out through their colour. A vein may be the trace of a fracture filled with a different mineral. It then represents the line of a later process passing through an earlier structure. This is particularly important to lithomorphogenesis: stone may possess not only layers, but also lines of secondary penetration. Form does not simply grow from within; it may be intersected by a new process.

In such a case, stone becomes comparable to a palimpsest—a surface upon which different records are superimposed. This comparison must, however, be understood as a metaphor. Stone is not inscribed by consciousness; it is formed by processes. Visually and structurally, however, it may genuinely preserve several superimposed orders. Layer, fold, fracture, vein and surface constitute different ‘records’ of geological history. Lithomorphogenesis allows them to be read as levels of form.

Within the submitted stone materials, it will be particularly useful to identify images displaying three groups of features: layering, undulation and curling. Layering will demonstrate sequence. Undulation will demonstrate deformation and dynamics. Curling will demonstrate possible centred or spiral-like organisation. If stones in which these features are clearly expressed can be selected, the chapter will acquire a compelling sequence of illustrations. The captions must, however, remain cautious: ‘undulating structure’, ‘spiral-like motif’, ‘layered internal

organisation' or 'folded line', rather than categorical claims concerning precise origins without analysis.

Stone also makes it possible to observe that not every form unfolds outwards. In a plant, unfolding frequently proceeds from within towards the exterior: a bud opens, a leaf spreads out and a flower unfolds. In stone, a structure may form internally and become visible only after destruction, fracture or sectioning. A wave in stone may therefore represent not the unfolding of the form itself, but its revelation to the observer. This is an important distinction at the geological level. Lithomorphogenesis encompasses not only the formation of a structure, but also the conditions under which it becomes visible.

The surface of stone serves in this sense as a mediator between process and perception. While the internal structure remains concealed, the observer sees only the outer covering. Once the surface is opened, lines, layers, waves and folds appear. Stone may therefore pass from the state of a 'closed body' into that of a 'legible surface'. This is not biological unfolding, but morphological revelation. The book must distinguish between these meanings of the word 'unfolding'.

Waves, layers and folds in stone also help to demonstrate that the Matrix need not manifest itself through living symmetry. Stone may be asymmetrical, fractured, incomplete or partially destroyed. Order may nevertheless persist within this incompleteness. An undulating line, for example, may be interrupted yet remain legible; a layer may be ruptured, but its continuation may be mentally reconstructed; and a vein may intersect a structure, creating a new order. Stone demonstrates that the Matrix may manifest itself through damage, rupture and remains.

This is particularly important for later chapters concerned with artefacts and cultural forms. Not every form is preserved intact. At times, the researcher works with a fragment. Stone teaches us how to interpret the fragment: part of a layer, wave, vein or fold. Even a fragment may preserve a morphogenetic invariant. What is absent, however, must not be reconstructed arbitrarily. What is visible, inferred and interpreted must be clearly distinguished.

The lithomorphogenetic analysis of stone may also employ the concept of direction. Layers possess direction. A wave possesses a direction of curvature. A vein possesses a direction of passage. A fracture possesses a direction of propagation. A fold possesses an axis. These directions allow stone to be perceived not as a static mass, but as a structure of vectors. In botany, direction is connected with growth; in stone, it is connected with force, pressure, the flow of matter, fracturing or a sequence of formation. Direction is a common invariant, but its meaning differs.

Cases in which directions conflict are particularly interesting. Layers may extend in one direction while a vein intersects them. Waves may curve while a fracture cuts across them. The external form of the stone may not coincide with its internal layering. Such conflicts demonstrate that the stone has undergone several processes. They make its structure more complex and more valuable for analysis. They reveal that form is not singular, but composed of a history of interactions.

Stone waves and folds may also be related to the concept of the 'slow gesture'. In a plant, the gesture of unfolding may be rapid and visible. In stone, the gesture almost disappears within time, but remains as a line. A wave, fold or curved stratum resembles the trace of a gesture made by geological force. This metaphor is philosophically expressive, but must remain secondary. The

principal description should remain material: pressure, curvature, layer, deformation and stabilisation. Philosophy then supplements rather than replaces geology.

An important conclusion of the analysis is an understanding of stone as a body in which form arises through the transformation of resistant matter. A plant gently unfolds its tissues, although stresses are also present there. Stone forms through more rigid processes: pressure, temperature, fractures, mineralisation and compaction. The stone Matrix therefore possesses a heavier and more stress-laden character. It presents the world not only as growing, but also as being compressed, bent, fractured and stabilised.

This broadens the general hypothesis. The Matrix should not be merely a model of harmony. It must also include deformation. Waves, layers and folds in stone demonstrate that order may arise after stress and through stress. A fold is not a defect; it is a form created by force. A fracture does not invariably merely destroy; it may become the channel of a vein. A wave is not an ornament; it may be a trace of movement. Stone teaches us to recognise the productive capacity of geological deformation.

Four types of images are particularly important for the illustrations accompanying this section:

1. A stone with clearly defined layering, in which successive bands and levels are visible (*Fig. 7*).
2. A stone with undulating lines demonstrating the curvature and rhythm of the structure (*Fig. 8*).
3. A stone with a spiral-like or curled motif in which a line is organised around an internal centre or bend (*Fig. 9*).
4. A stone with folded deformation in which a layer has clearly been compressed, bent or transformed by pressure (*Fig. 10*).

Such images will make the lithomorphogenetic analysis visually accessible.

Waves, layers and folds in stone allow an important conclusion to be drawn: stone is not the opposite of morphogenesis. It represents another type of morphogenesis—slow, non-living, lithic and connected with pressure, matter and time. Its lines do not grow like the veins of a leaf, but they record processes. Its layers are not petals, but they demonstrate sequence. Its folds do not open like a bud, but they preserve the memory of deformation. Its waves do not move in the present, but they preserve the form of movement.

The lithomorphogenetic level of the Matrix thus demonstrates that universal invariants of form may manifest themselves within stone through layering, undulation, folding, veins, fractures, spiral-like motifs and internal boundaries. These features should not be mystified or identified with biological mechanisms. They nevertheless allow stone to be perceived as a complex body of process. Stone becomes not a dead mass, but a stabilised form of deep time in which movement, pressure and matter have acquired a visible morphological record.

Waves, layers and folds in stone are therefore key features of lithomorphogenesis. They demonstrate that stone form may be interpreted as the outcome of a prolonged history: accumulation, compression, bending, fracturing, mineralisation and stabilisation. Through these structures, the geological level of the Matrix reveals another mode through which form comes into being—not biological growth, but the slow formation of matter under the influence of time, pressure and internal organisation.

12.4. Stone as ‘Frozen Time’

The concept of stone as ‘frozen time’ is central to the geological level of the Matrix. It should not be understood literally or poetically in isolation from the material itself. Stone does not preserve time in the manner of consciousness, a text or the memory of a living organism. It does, however, record traces of processes that occurred within matter over extended periods. In this sense, stone may indeed be regarded as a form in which time has become structure: a layer, fracture, vein, fold, crystal, surface, line of pressure or colour transition.

Unlike a plant, stone does not demonstrate development at a pace readily accessible to human observation. A leaf may be observed when young, unfolding, mature and ageing. A flower may be observed from the bud to full opening. A fruit may be followed from the ovary to the seed. Stone is usually presented to the observer as an outcome already formed. It does not unfold before our eyes, germinate, flower or bear fruit. Its process is concealed within the past. Stone therefore requires a distinctive mode of observation: not the observation of growth currently taking place, but the reconstruction of preceding formation.

It is here that the image of ‘frozen time’ emerges. Stone appears immobile because its changes are too slow for ordinary human perception. This immobility, however, does not imply the absence of history. On the contrary, stone is frequently the result of numerous events: the accumulation of sediment, pressure, crystallisation, metamorphism, fracturing, mineralisation, destruction, transportation, weathering and exposure. All this may be contained within a single small fragment. A small stone may preserve traces of an immense span of geological time.

Layering is the most evident form of frozen time. Each layer indicates sequence. One layer forms earlier and another later; one may be thicker and another thinner; one lighter and another darker; one straight and another deformed. Even when precise geological interpretation requires specialised methods, the morphology of the layer itself already demonstrates that stone possesses temporal depth. A layer is not merely a line. It is a boundary between states of matter.

Undulating and folded structures reveal another aspect of time. They record not only sequence, but also an event of deformation. A layer may once have been relatively even and subsequently subjected to pressure, bending or transformation. A fold then appears within the stone. This fold is not merely a beautiful line, but a trace of force acting over time. It demonstrates that the stone underwent a transformation of form. A fold is therefore time expressed through stress.

Veins and fractures add another temporal level. A fracture may have arisen after the host rock had formed. Mineralised solutions may subsequently have passed through it, transforming the fracture into a vein. At least two phases then become visible within the same stone: the original body and the later penetration of new matter. If the stone was subsequently broken, abraded or polished, another phase is added. Stone proves to be not a simple form, but a multilayered chronology of material.

It is particularly important that stone records not only constructive, but also destructive processes. Fractures, faults, broken surfaces, weathered surfaces and fractured edges are all traces of destruction. In the lithomorphogenetic sense, however, destruction does not invariably represent only a loss of form. It may reveal the internal structure, create a new surface, provide a pathway for mineralisation, separate a fragment from a larger body or prepare matter for a new cycle. Stone demonstrates that destruction may also form part of the history of form.

In this respect, stone differs from an image of an instantaneous state. It is not a photograph of a single moment, but a compressed record of numerous moments. Traces of different phases may

coexist upon its surface or in section: the initial accumulation of matter, subsequent deformation, a later vein, surface destruction, weathering, polishing or natural exposure. All these are simultaneously present before the observer's eyes. Stone spatialises time.

This spatial presence of time is particularly important to the hypothesis of the Unified Matrix of the Universe. At the biological level of the Matrix, time was manifested as a cycle: seed, shoot, plant, flower, fruit and new seed. In stone, time manifests itself differently: not as an evident life cycle, but as an accumulated history of matter. Whereas the plant demonstrates time through a sequence of living stages, stone demonstrates time through its internal structure. The geological level therefore broadens the concept of morphogenesis: form may not only develop, but also preserve duration.

Stone as 'frozen time' also allows the concept of memory to be refined. In biology, memory may be hereditary, morphological and cyclical. A seed carries the potential for a future organism. Stone carries traces of matter's past. It is not directed towards the future in the same way as the seed. It does not contain the embryo of a new living form. It does, however, preserve information about what has already occurred. Stone is therefore not the seed of the future, but an archive of the past. This fundamental distinction must be maintained.

There is nevertheless an important morphological parallel between the seed and stone: both may be small bodies containing more time than is visible externally. The seed contains a future cycle in potential form. Stone contains a past process in structural form. The seed compresses the future; stone compresses the past. The seed awaits unfolding; stone awaits interpretation. This is a powerful philosophical comparison, but it must not erase the distinction between biological and geological levels.

Stone is particularly expressive because its time is not arranged linearly before the observer. It is enfolded. Layers, fractures, veins, folds and surfaces may all be visible within a single fragment. The observer sees them simultaneously, although they may have arisen during different phases. Stone therefore requires analytical unfolding. The visible structure must be mentally separated into possible sequences: what was primary, what was secondary, what caused deformation, what intersected the structure and what revealed the surface. Stone is an enfolded geological history requiring interpretative unfolding.

Stone is therefore connected with the concept of concealed structure. Before sectioning or fracture, its internal history may remain invisible. Its exterior may be simple while a complex organisation exists within it. A section through stone transforms concealed time into visible time. Yet it is important to understand that the section does not create this history, but merely reveals it. The human being selects the plane of revelation, but the structure itself was formed beforehand. In this sense, a section through stone is an act of interpreting lithomorphogenesis.

The surface of stone is likewise a result of time. It may have been abraded by water, worn by sand, fractured by frost, polished by a human being, covered with a patina or altered by weathering. Even when the internal structure is not visible, the external surface may preserve traces of the environment. A rounded stone indicates transportation and abrasion; a sharp fracture indicates breakage; roughness indicates composition and weathering; and fractures indicate stresses. The surface of stone is a boundary archive: it records the encounter between internal matter and the external environment.

Undulating structures demonstrate the idea of frozen time particularly clearly. A wave is ordinarily associated with movement, water, air, oscillation and transition. When a wave is visible in stone,

however, movement becomes an immobile line. It is not a living wave, but the trace of a process stabilised within material. Such a form has powerful philosophical significance: stone demonstrates movement that no longer moves, but has been preserved as structure.

The fold intensifies this idea. A fold in stone may be the result of immense pressures and prolonged geological transformations. It demonstrates that stone matter was not always positioned as we now observe it. It was compressed, bent and transformed. The fold makes pressure visible. It is a form in which force has become a line. A geological fold is therefore one of the most expressive images of geological time.

The vein demonstrates another aspect: time as penetration. When a fracture is filled with mineral matter, a new line appears within the stone, differing in colour, composition or texture. It seems to pass through the pre-existing body, connecting rupture with new matter. The vein demonstrates that the history of stone may remain open to later processes. Stone does not always form once and for all. It may subsequently be altered, intersected, filled and transformed. In this sense, stone is a body of superimposed events.

Layers, waves, folds and veins form a distinctive chronology of form. This chronology, however, is not always evident. From a single image, it may be difficult to determine precisely what arose earlier and what later. Lithomorphogenetic analysis must therefore remain cautious. It is appropriate to say that ‘the structure suggests the presence of several phases of formation’, that ‘the veins may indicate the later filling of fractures’, that ‘the undulation may be connected with the deformation of layers’ or that ‘the layering records a sequence of changes’. Such language preserves analytical precision.

Stone as frozen time should not be understood as an absolutely immobile archive. Stone continues to exist within an environment and may change. It may weather, break down, dissolve, fracture, acquire surface deposits or be moved by water or human beings. ‘Frozen’ time therefore does not mean that a process has ceased for ever. It means temporary stabilisation sufficient for traces of the past to become durably visible. Stone is a pause within a process rather than the definitive end of that process.

This proposition is particularly important to the model of the Matrix. If a form is perceived as complete, it may mistakenly be taken for an immobile essence. Stone demonstrates, however, that completion is relative. It has already formed, yet may be destroyed again. It is stable, but not eternal. It preserves the past while remaining incorporated into the future geological cycle. Even stone therefore forms part of a cycle of matter, although that cycle is not biological.

The geological cycle differs from the biological one. In biology, a seed produces a plant, the plant produces a flower and fruit, and the fruit produces a new seed. In geology, rock may be broken down and become sediment; the sediment may be compacted and transformed into new rock; and the rock may undergo metamorphism, melting, uplift and erosion before re-entering the cycle. Stone as a fragment may constitute a temporary state within this cycle. It records one phase without exhausting the entire process.

In this sense, stone may be considered as a stabilised stage D within a geological process. The preceding stages may have included the initial matter, accumulation, crystallisation, pressure, deformation and mineralisation. Within the visible stone, these processes have already acquired a stable form. D may subsequently pass into a new A: the stone breaks down and becomes a fragment, grain of sand, sediment or material for a new layer. This is not reproduction by seed, but geological transformation. The cyclicity of matter is nevertheless present.

Stone as ‘frozen time’ also helps us understand the relationship between scales. One small fragment may form part of a vast geological body. Its layers may continue far beyond the limits of the individual stone. Its fold may be part of a larger folded structure. Its vein may be a fragment of a more extensive fracture system. A small stone is therefore frequently part of a much greater history. It carries within itself a scale exceeding its own dimensions.

This makes stone particularly important for fractal and multiscale thought. A small fragment may preserve features of a large process. Small lines within the stone may repeat larger directions. Fractures may exhibit self-similar characteristics. A surface may possess relief that repeats complexity across different scales. As before, however, such features must be described cautiously: self-similarity must be observable and limited rather than declared in advance.

Stone also demonstrates that time may possess not only a horizontal, but also a deep dimension. Layers may lie above one another, extend inwards or become visible on a fracture surface. A surface may conceal depth. A section may reveal the internal. Stone form therefore requires thought not only across a plane, but also into depth. In botany, the leaf as a plane revealed the surface. Stone as a geological body reveals volume. Its time is located not only on the surface, but also within.

The internal depth of stone is particularly important to the philosophy of the Matrix. The Matrix should not be understood solely as an external arrangement of elements. It includes concealed organisation that may remain invisible without a specialised mode of revelation. Stone provides one of the clearest examples of such concealed organisation. Its external contour may be secondary, while its internal structure is the principal bearer of its history. Stone therefore teaches us to interpret not only form, but also its deep architecture.

Stone as frozen time is also connected with the concept of slowness. Contemporary perception is frequently oriented towards rapid change: growth, movement, events and reactions. The geological level requires another scale of attention. Stone changes the rhythm of thought. It demonstrates processes that do not correspond to human speed. In this sense, stone introduces the category of profound duration into the hypothesis of the Matrix. Form may arise not only rapidly and organically, but also slowly and almost imperceptibly through pressure and accumulation.

This slowness does not make stone less significant. On the contrary, it makes stone a distinctive bearer of form. In a plant, form is often fragile and short-lived. A flower may disappear rapidly. A leaf may wither. Stone may preserve its structure for an exceptionally long period. It is a durable witness. Its duration enables it to function as an archive. The same duration, however, makes its process less evident. Stone therefore requires intellectual as well as visual perception.

Stone also demonstrates that form may be the result of the patience of matter. This expression is philosophical in character, but helps to convey the particular nature of lithomorphogenesis. Processes within stone do not hurry. Matter accumulates, compacts, changes, bends, crystallises, fractures, is filled and stabilises. Each change may be slow, but the result is a complex structure. Stone demonstrates that complexity does not invariably require rapid growth; it may arise through prolonged preservation and gradual transformation.

This is particularly important for the visual analysis of the submitted stones. Their patterns should not be perceived as images created instantaneously. Even when a stone is found as a small object, its internal structure may be the trace of a very long history. An undulating line, layered

band, spiral-like motif or vein should be considered as a possible trace of processes considerably older than the moment of observation. This gives stone a particular depth within the book.

Stone may also be understood as a body in which the past has not entirely disappeared. In ordinary time, an event passes. In stone, an event may leave a trace. The pressure has ceased, but the fold remains. A fracture may have formed long ago, but its line is still visible. A solution once moved, but the vein has been preserved. Sediment accumulated, and the layer remains. Stone thus demonstrates how the past may persist within material. This is not the memory of consciousness, but the preservation of a trace.

Such an understanding is important for connecting the geological level with the cultural. An artefact may likewise preserve traces of time: processing, wear, damage, layers of meaning and historical context. Stone, however, preserves time before and beyond culture. It demonstrates the material memory of nature. Later, when stone becomes an artefact, this natural memory may become combined with cultural memory. In this chapter, however, the natural, lithomorphogenetic level must remain the focus.

Stone as frozen time also helps to explain why human beings frequently experience a sense of antiquity in the presence of stone. This feeling may be aesthetic, philosophical or cultural, but it possesses a material basis. Stone is genuinely often older than human buildings, texts and individual lives. Its structure may be a trace of processes that occurred long before the observer existed. Stone therefore evokes a sense of temporal depth for a reason. It is an object in which duration has become tangible.

This sense of antiquity must not, however, lead to mystification. Stone is not a magical bearer of secret knowledge. It is a natural object formed by geological processes. Its ‘mystery’ lies not in a supernatural meaning, but in the complexity of matter and time. A scientific and philosophical approach should reveal this depth without transforming stone into a mystical symbol. Stone is important precisely because its actual materiality is already sufficiently profound.

Within the Matrix, stone as frozen time also makes it possible to perceive form as a compression of processes. A compressed structure may contain a prolonged history. A small object may be the result of immense forces. A visible pattern may be the trace of invisible conditions. This brings stone closer to the general logic of the study: form is always greater than its contour. Behind the contour lies a process, behind the process an environment, and behind the environment time. Stone makes this depth particularly apparent.

Stone may be described as one of the most radical forms of materialised history. It contains no narrative in words, no organic behaviour and no symbolic programme, but it does possess structure. This structure may be interpreted as a trace. Layer, fold, vein, fracture and crystal are all elements of geological writing without an author. Such a comparison is permissible as a philosophical metaphor, provided it is remembered that ‘writing’ here denotes not intention, but physical recording.

Stone as ‘frozen time’ also allows the relationship between contingency and regularity to be examined. Stone form contains contingent elements: breakage, fracture, a particular plane of section, external damage and the individual form of the fragment. Within this contingency, however, regular structures may exist: layers, crystals, veins, rhythms and folds. Stone combines a contingent fragment with a regular process. This makes it particularly valuable to the Matrix, where order must be perceived not as ideal regularity, but as structure preserved within heterogeneity.

Stone should therefore not be expected to display perfect symmetry. Geological form is frequently asymmetrical, incomplete, damaged and ruptured. Yet it may remain morphogenetically significant. A geological fold may be partly destroyed but still demonstrate pressure. A vein may be irregular but still record the path of mineralisation. A layer may be interrupted but still provide evidence of sequence. Stone teaches us to perceive incomplete order.

This is important for the illustrations as well. The sequence of stone images should not be excessively 'perfect'. Useful examples include not only stones with beautiful symmetrical patterns, but also those revealing genuine complexity: rupture, waves, intersections, irregularity, damaged edges and heterogeneous surfaces. Such images convey the geological nature of the Matrix more accurately. They demonstrate that order in stone frequently arises through the interaction and conflict of processes rather than through pure geometry.

Stone as frozen time may be described through several analytical questions. What within a particular structure indicates sequence? Which lines may represent layers? Where are signs of deformation visible? Are there fractures and veins? What appears primary and what secondary? Which surface reveals the internal? Is there rhythm? Is there a change of colour? Is a direction of pressure, flow or crystal growth visible? These questions transform stone from an object of contemplation into an object of investigation.

This is the approach that should be applied to images of stones within the book. If a stone possesses bands, they should be presented as layers or structural zones. If its lines are undulating, they should be presented as possible traces of deformation or movement. If an intersecting vein is present, the superimposition of processes should be demonstrated. If the stone has been polished, it should be stated that the visible surface reveals its internal structure. If a spiral-like motif is present, it should be described as an organised curvature without attributing excessive meaning to it.

Images in which time can be demonstrated through structure are particularly important for the illustrations accompanying this section:

- The first image may present a layered stone as a sequence of geological phases (*Fig. 11*).
- The second may show a stone with intersecting veins and fractures as an example of the superimposition of different events (*Fig. 12*).
- The third may show a stone with a wave or fold as a form of stabilised pressure (*Fig. 13*).
- The fourth may be a comparative diagram in which the different elements of a stone are interpreted as temporal levels: layer, fold, fracture, vein and surface (*Fig. 14*).

The captions should be precise and analytical. For example: 'Layered stone as a record of successive phases in the formation of matter'; 'Veins and fractures as traces of later processes superimposed upon the primary structure'; 'A geological fold as a stabilised form of pressure'; 'Stone as a multitemporal structure: layer, deformation, fracture and surface'. Such captions will connect the images with the text and prevent the visual sequence from becoming merely a collection of attractive stone patterns.

Stone as frozen time also prepares the ground for the following section, in which stone structures will be related to the A–B–C–D model. Thus far, stone has been considered as an archive of duration. It will now be necessary to demonstrate how this duration may provisionally be divided into stages: an initial nucleus or matter, the primary disruption of homogeneity, the development

of layers or deformations, and the stabilised form. Such a scheme should not replace geological history, but may serve as a useful instrument of morphogenetic interpretation.

Thus, within the hypothesis of the Unified Matrix of the Universe, stone may be understood as ‘frozen time’ in a strictly limited sense. It does not preserve time as consciousness does and does not develop like an organism. It does, however, record prolonged material processes: pressure, layering, flow, crystallisation, fracturing, veining, folding, destruction and stabilisation. Its structure is a material record of geological becoming. In stone, time does not disappear, but becomes visible through form.

Stone is therefore not an instantaneous object, but a body of duration. Its lines, layers, folds, veins and surfaces may be regarded as traces of processes that took place in deep time. Stone demonstrates another mode of the Matrix: not the rapid unfolding of living form, but the slow recording of geological history. Stone as ‘frozen time’ therefore becomes a key to understanding lithomorphogenesis as a form in which matter, pressure and time have acquired a stable morphological record.

12.5. Stone in the A–B–C–D Model

Applying the A–B–C–D model to stone requires particular caution. In biological material, this model is based upon the observable cycle of living form: seed, germination, growth, unfolding, fruit and new seed. No such biological cycle exists in stone. Stone has no embryo, does not germinate, does not open like a flower, does not produce fruit and does not reproduce itself through seeds. At the geological level, the A–B–C–D model cannot therefore be transferred literally. It may be used only as an analytical scheme for describing the successive formation of stone structure: initial integrity, the first disruption of homogeneity, the development of internal organisation and the stabilisation of form.

It is only in this provisional sense that stone may be incorporated into the model of the Matrix. At the lithomorphogenetic level, A denotes not a seed, but an initial state of matter or initial structural integrity. B denotes not germination, but the first manifestation of difference: a fracture, layer, direction of crystal growth, nucleus of an inclusion, beginning of deformation or primary boundary. C denotes complexification: the development of layering, veins, folds, crystalline zones, fracture networks and undulating lines. D denotes the stabilised stone form in which preceding processes have acquired durable expression. A new A may arise through destruction, transportation, sedimentation or the incorporation of matter into a new geological cycle.

This application of the model is not an attempt to ‘animate’ stone. On the contrary, it emphasises the distinction between living and non-living morphogenesis. Biological A is connected with potential life, whereas geological A is connected with initial matter, a nucleus, layer, inclusion or state of rock. Biological B is connected with the beginning of growth, whereas geological B is connected with the primary differentiation of matter. Biological C is connected with the development of organs and tissues, whereas geological C is connected with the internal complexification of structure. Biological D is connected with the mature form of an organism or organ, whereas geological D is connected with stabilised rock, stone, crystal, fold or section in which the process has already become a visible outcome.

At the level of stone, stage A may be understood as a nucleus or initial integrity. It may be:

- an initial mineral centre around which a concretion forms;
- a crystallisation nucleus;
- initial sediment or a volume of magmatic matter;
- an inclusion within rock;
- the primary mass of material before pronounced stratification;
- a zone in which a complex structure has not yet developed.

Unlike a seed, such an A does not carry the biological programme of a future organism. It does, however, constitute an initial state from which a stone structure may develop.

In some stones, stage A may be visible as a nucleus. Concentric structures, ring-shaped patterns, inclusions or central zones of crystallisation, for example, allow an initial centre to be distinguished morphologically. In other cases, A is not directly visible. It may be reconstructed as the primary matter preceding stratification, deformation or fracturing. This is an important distinction at the geological level: the initial stage is not always observable. Stone frequently presents us only with the outcome, while its earlier states must be understood through traces.

Stage A in stone is connected with closure, although not in the biological sense. Stone may be a closed body whose internal structure remains concealed. Until the surface is opened through fracture, sectioning, erosion or polishing, its internal organisation may remain invisible. Geological A may therefore also be understood as a concealed state of form. Layers, veins or crystalline zones may already exist within, but remain unmanifested to the observer. In this sense, stone as a closed body resembles a fruit or seed only morphologically: it contains a concealed structure, but not future life.

At the level of stone, stage B corresponds to the initial emergence of differentiation. In biology, B is the emergence of the radicle from the seed, the first rupture of the outer covering and the appearance of the axis. In stone, B may be the first disruption of homogeneity: the emergence of a layer, fracture, vein, crystallisation zone, colour boundary, direction of pressure or axis of a fold. It is the moment at which matter ceases to be homogeneous and begins to acquire an internal structure.

The fracture is one of the most expressive variants of B. It disrupts the integrity of the stone body, but may simultaneously become a line of future organisation. If the fracture remains empty, it records rupture. If it becomes filled with mineralised solution, it is transformed into a vein. The initial disruption then becomes a new structural line. In this sense, B at the level of stone demonstrates that rupture may constitute the beginning of a new form rather than merely its destruction.

Another variant of B is the appearance of the first layer or boundary between layers. When matter begins to accumulate unevenly, or when its composition, colour, density or structure changes, a difference arises. This difference establishes the direction of future layering. The primary boundary becomes the beginning of a sequence. If the layers subsequently recur, become deformed or are intersected by veins, stage B passes into C. The layer may therefore be regarded as the first act of geological differentiation.

Stage B may also be connected with crystallisation. Crystal growth begins from a particular zone, centre or surface. Order subsequently propagates through the matter, creating facets, zones and directions of growth. Crystallisation demonstrates that non-living matter is capable of the

organised formation of structure. This organisation, however, is physicochemical rather than biological. Within the A–B–C–D model, crystallisational B may be understood as the beginning of the ordered growth of mineral form.

At the level of stone, stage C is the phase of complexification. Layers, waves, folds, veins, internal boundaries, crystalline zones, fracture networks, fields of colour, inclusions and deformations are formed during it. If B represents the first difference, C represents the development of differences into a system. Stone becomes not merely a body containing one line or layer, but a complex structure in which different elements interact, are superimposed and record a sequence of processes.

Layering is one of the principal manifestations of C. Several layers create rhythm, sequence and internal depth. If the layers remain straight, they demonstrate relatively stable accumulation. If they bend, folding appears. If they are intersected by veins, processes are superimposed. If the layers differ in colour and thickness, the structure becomes more expressive. C is therefore the stage during which stone acquires an internal architecture.

The fold also belongs to stage C because it demonstrates the transformation of a pre-existing structure. A layer must exist before it can be bent. A fold arises through pressure, deformation and plastic or brittle–ductile change. It makes visible not only the presence of layers, but also their history of stress. A folded structure is therefore one of the strongest lithomorphogenetic features of C: it combines layer, force, time and form.

Veins and fracture networks likewise belong to C. They may arise after the primary formation of the rock and intersect pre-existing layers. Stone then becomes a multitemporal body: one system of lines belongs to one process and another to a different process. A vein may pass through a layer, change the visual structure, create a new focus of attention or divide the surface. At C, stone becomes not merely sequential, but superimposed: different events leave traces within a single body.

Stage C may also include spiral-like or undulating motifs. When a line within stone bends, curls, changes direction or forms a wave or spiral, this indicates a complex organisation of internal movement or deformation. It is not always possible to determine the precise mechanism of such a motif, but morphologically it indicates the complexification of a simple line. A straight boundary becomes a curve; a layer becomes a wave; a rupture becomes a vein; and a crystallisation zone becomes a complex texture. This is the logic of C: difference develops into a composite structure.

At the level of stone, stage D denotes stabilised form. It may be a stone, crystal, rock section, folded fragment, polished surface or natural fracture in which preceding processes have acquired visible stability. D does not signify perfection or completion in an absolute sense. It means that a particular history of matter has been temporarily fixed within a structure accessible to observation. Stone at stage D is not the ‘end’ of the geological process, but its stabilised outcome.

D is especially visible in stones whose internal structures have been revealed. A section displays layers, veins, rings and crystalline zones. A polished surface makes lines clear. A fracture reveals internal boundaries. A natural surface may display a weathered structure. In each case, D is a moment of visibility: stone becomes legible as form. It is important to remember, however, that visibility may depend upon the method of revelation. Sectioning or polishing makes it possible to observe a structure formed earlier.

A stabilised stone form may appear complete, but remains incorporated into the subsequent geological cycle. Stone may break down, become sediment, enter a new rock or undergo renewed pressure, dissolution or transportation. D may therefore pass into a new A, although this transition differs from the biological one. In biology, the new A is a seed. In geology, the new A may be a fragment of matter, sediment, mineral particle, nucleus of new crystallisation, new sedimentary mass or material for a future rock.

This D → new A transition is particularly important. It demonstrates that stone also exists within a cycle, although this cycle is not a life cycle. A stabilised form may be destroyed and its matter incorporated into a new process. A rock face becomes fragments; the fragments become pebbles or sand; the sand becomes sediment; the sediment becomes rock; and the rock becomes a new stone. This is the geological cyclicity of matter. It is slow, non-living and material, but allows form to continue through transformation.

Stone therefore occupies a distinctive position within the A–B–C–D model. It demonstrates not the reproductive cycle of an organism, but a cycle of matter and structure. The biological Matrix transmits form through inheritance and development. The geological Matrix transmits structure through transformation, destruction, transportation and renewed formation. In both cases, there is a transition from the concealed to the manifest, from the simple to the complex, from stress to stabilisation and from an outcome to a new beginning. The mechanisms, however, differ and must remain distinct.

This distinction is particularly important to the research project as a whole. If the A–B–C–D model is applied too literally, it will lose precision. Stone is not a seed. A fracture is not a shoot. A mineral vein is not a leaf vein. A geological fold is not a petal. At the level of morphological logic, however, corresponding relationships may be observed: concealment—manifestation of difference—complexification—stabilisation—renewed incorporation into a cycle. This is what makes it possible to use the model of the Matrix without biologising geology.

Stone also demonstrates that stage A does not always precede B in a simple observable sequence. We frequently encounter D first—the completed stone. We then reconstruct C, B and A from its structure. Analysis therefore proceeds not from the beginning towards the outcome, but from the outcome towards possible stages. In biology, we can observe germination and growth. In geology, we must more often interpret traces. Stone therefore requires a reverse method: from the visible form towards its possible history.

This reverse method is an important component of lithomorphogenesis. The researcher observes a stabilised structure and asks: Where is the trace of the primary matter? Where did differentiation begin? Which lines indicate the development of the structure? Which elements may have arisen later? How did the form stabilise? Which features indicate subsequent destruction or revelation? In such a case, the A–B–C–D model becomes not only a scheme of process, but also an instrument of reconstruction.

When analysing a particular stone, the following sequence of questions may be used. What may be considered the initial integrity or nucleus? Where does differentiation first appear: in a layer, fracture, colour boundary, crystal or inclusion? How does that differentiation develop: does it become a network, wave, fold, vein or system of layers? What constitutes the stabilised form: the whole stone, its section, surface, crystalline zone or folded fragment? Are there signs of subsequent destruction, transportation or incorporation into a new cycle? These questions allow the model to be applied rigorously and cautiously.

In some stones, A may be expressed as an internal nucleus. The structure may then develop around a centre: rings, zones, concentric bands or crystalline shells. In such cases, the A–B–C–D model is relatively easy to interpret: nucleus, primary shell, subsequent accumulation of layers and stabilised concentric form. Not all stones, however, possess centred structures. In other cases, form is organised not around a centre, but along a layer, axis of pressure or direction of a fracture. A may therefore be not a point, but a line or state of matter.

In stones with layered structures, A may be the initial surface of accumulation or primary layer. B is the emergence of differentiation between layers. C is the development of a multilayered sequence and its deformation. D is the stabilised layered rock or fragment. If that rock subsequently breaks down and its parts become sediment, a new A of the geological cycle arises. Such a scheme is particularly appropriate for stones with banding and undulating layers.

In veined stones, the model may be different: A is the host rock; B is the fracture or rupture; C is the filling of that fracture with minerals, the development of a vein network, possible intersections and secondary lines; and D is the stabilised veined structure. The new A is a fragment of this rock that may be destroyed, transported or incorporated into another process. Here, B is especially important: the fracture as a disruption of integrity becomes the beginning of a new internal structure.

In crystalline structures, A may be a crystallisation centre or initial zone of growth. B is the emergence of the first facets or crystallographic directions. C is the development of the crystalline body, growth zones, inclusions and boundaries. D is the formed crystal or crystalline aggregate. A new A may arise through the destruction, dissolution or recrystallisation of the crystal, or through the incorporation of its matter into a new mineral process. Here, the model demonstrates the order of non-living growth.

In folded structures, A may be the initial layer or system of layers before deformation. B is the beginning of pressure or bending. C is the development of the fold, compression, undulating deformation and possible ruptures. D is the stabilised folded form. A new A may arise through the destruction of the fold, formation of fragments or incorporation of the material into a new geological cycle. Here, the model demonstrates with particular clarity that form may arise through stress.

Stone within the A–B–C–D model also demonstrates the importance of C as the stage of most pronounced internal complexity. It is C that makes stone interesting for visual analysis. Simple initial material may possess almost no visible structure. A primary fracture or layer does not yet create a rich form. When layers bend, veins intersect the surface, crystals create zones, fractures form networks and colours change, however, stone becomes morphogenetically saturated. C is the stage at which stone acquires its internal ‘biography’ in visible form.

Unlike D in a plant, D in stone may be discovered long after its formation. A mature leaf is visible during the life of the plant. A mature stone may be found after an immense period has elapsed since it formed. At the geological level, D is therefore not merely a stage of maturity, but a stage of preservation. Stone form must not only arise, but also survive in order to become accessible to observation. This is an important feature of geological morphogenesis: what becomes visible is what has survived time.

The preservation of stone is not absolute. Some structures are destroyed, erased, recrystallised, covered by new layers or eliminated by erosion. The visible stone is therefore always the result of selection by time. It reveals not every process that occurred, but those whose traces were

preserved. This makes lithomorphogenetic interpretation incomplete and probabilistic. It must be acknowledged that stone may preserve only part of its history.

For this reason, the A–B–C–D model must remain open when applied to stone. It does not provide a complete geological scenario. It helps to organise observation. When a structure is complex, the model allows possible levels to be identified: initial matter, primary differentiation, structural development and stabilised outcome. The precise origin of each element, however, requires separate analysis. In a scientific and philosophical book, it is sufficient to demonstrate the morphological logic, but unsupported geological conclusions should not be drawn.

Stone also helps to refine the concept of ‘unfolding’. In biology, unfolding is an action performed by the form itself: a flower opens, a leaf unfolds and a fern spreads out. In stone, revelation may result from an external event: fracture, sectioning, erosion, weathering or polishing. The stone structure may have formed long ago but become visible only later. For the observer, stage D may therefore occur not when the structure formed, but when it was revealed to view. This distinction must be taken into account.

Two forms of D may be distinguished: geological D and visual D. Geological D is the moment at which the structure stabilised within the rock. Visual D is the moment at which that structure became visible on a surface, in section or on a fracture face. These two moments sometimes coincide, but often do not. A vein, for example, may have formed long ago but become visible only after the stone was sectioned. Lithomorphogenesis must therefore take account not only of the formation of a structure, but also of its discovery.

This is particularly important for illustrations. A polished stone section demonstrates visual D, while geological D occurred earlier. A natural fold within an outcrop may simultaneously constitute both a geological outcome and a visible exposure. A pebble with internal bands may be the result of the destruction of a larger body, meaning that its external contour is younger than its internal structure. A caption may state: ‘The section reveals a stabilised internal structure’; ‘The natural fracture exposes layering’; or ‘The abraded surface preserves traces of internal banding’.

Stone within the A–B–C–D model also demonstrates that stage D may be aesthetically the most expressive, but analytically insufficient. A beautiful stone pattern attracts attention, but the researcher must ask: Which stages may lie behind this pattern? What is primary? What is secondary? Where is the trace of pressure? Where is the layer? Where is the vein? What was revealed by sectioning? Without such questions, D remains merely a picture. The model helps transform the picture into a process.

In this respect, stone teaches reverse morphological thinking. We observe the outcome and must reconstruct the pathway. In botany, it is possible to proceed from seed to flower. In stone, it is frequently necessary to proceed from the stone surface towards a possible past. This mode of thinking is particularly important to the entire hypothesis of the Matrix because many levels of the world are presented to us not in process, but through outcomes: cliffs, nebulae, artefacts, ancient symbols and architectural forms. Stone becomes a school of reconstruction.

At the level of stone, the A–B–C–D model also emphasises the role of the threshold. In biology, a threshold is the moment of germination, the opening of a bud or the emergence of a leaf. In stone, a threshold may be the initiation of a fracture, the transition of matter into crystallisation, a change of pressure, the beginning of deformation, a change in depositional conditions or the penetration of a solution. Such thresholds are not always directly visible, but their traces may be

manifested within the structure. Stone demonstrates that a threshold may be an event of matter, not solely an event of life.

The threshold of the fracture is particularly expressive. Before fracturing, the stone preserves its integrity. After fracturing, a new boundary appears. This boundary may remain empty, become a line of weakness, be filled with mineral matter or branch. A small event of disruption may therefore transform the entire internal morphology of the stone. Within the A–B–C–D model, the fracture is frequently B and the system of veins C. This is a compelling example of rupture becoming structure-generating.

The threshold of the layer is likewise important. A change in the conditions of formation may create a new layer. Its thickness, colour, composition and texture record a distinction between phases. When such distinctions recur, layering arises. If the layer is subsequently deformed, a fold appears. In such a case, B is the boundary of differentiation, C is the development of a recurring layered system, and D is the stabilised layered and folded form. This demonstrates that even a gradual change in conditions may become the beginning of a complex structure.

Stone within the A–B–C–D model also helps us understand the role of the external environment. A biological seed requires water, temperature, soil and light. Stone matter depends upon pressure, temperature, solutions, time, surrounding rocks, the movement of water, tectonic forces and erosion. In both cases, form does not arise autonomously. In geology, however, the environment operates differently: more slowly and rigidly, through physicochemical conditions. The geological Matrix is therefore a Matrix of environment and matter rather than of hereditary programming.

This distinction is important when formulating universality. If the Matrix manifests itself through living growth in plants and through geological formation in stone, universality cannot mean identity of mechanism. It can mean only the recurrence of particular relationships: initial integrity, disruption of homogeneity, development of internal structure, stabilisation and the possibility of a new cycle. The A–B–C–D model thus becomes not a biological scheme, but a metamorphological language.

Stone also demonstrates that a new A may arise through the destruction of D. In biology, a new A frequently arises through reproduction. In geology, a new A frequently arises through disintegration. Stabilised rock breaks down into fragments, sand, clay and dissolved substances. These materials may subsequently become the beginnings of new deposits, rocks or crystals. The geological cycle therefore possesses a more pronounced destructive and transformative character. Destruction is not the opposite of the cycle, but part of it.

This has philosophical significance. The Matrix should not be understood solely as creation. It includes destruction when destruction becomes a condition for new form. Stone demonstrates this particularly clearly: a rock face must break down to become sediment; sediment must be compacted to become rock; rock may undergo deformation to form a fold; and a fracture may arise in order to become a vein. The geological level teaches us to recognise the form-generating role of disintegration.

Stone within the A–B–C–D model also helps to refine the concept of the edge. At stage A, the edge may be the external boundary of the initial body. At stage B, an edge may arise as a fracture or layer boundary. At stage C, internal edges multiply: the edges of layers, veins, crystals and fractures. At stage D, the external edge of the stone may result from destruction, fracture,

abrasion or processing. Stone therefore possesses numerous edges belonging to different temporal phases. The external edge is not always the oldest or most important.

This is an important difference from many biological forms, in which the external edge of an organ is frequently connected with its growth. In stone, the external edge may be secondary. A pebble with a banded internal structure, for example, may have been abraded after its layers formed. Its internal lines are then older than its external contour. When analysing stone, it is therefore necessary to ask: Which edge is structural, which destructive, which superficial and which internal? The A–B–C–D model helps distinguish these levels.

Stone also helps us understand that stabilisation does not invariably imply harmony. D may be complex, damaged, asymmetrical and ruptured. A stabilised form may contain fractures, displacements, deformations and broken edges. This does not make it less significant. On the contrary, the damage itself may bear its history. The geological Matrix frequently manifests itself not as ideal order, but as a preserved trace of stress. D in stone is therefore not a perfect form, but a form that has retained the process.

When applied to stones, the A–B–C–D model may be used as a means of captioning and analysis. A stone with layered waves, for example, may be presented as follows: initial material—primary stratification—undulating deformation—stabilised stone surface. A veined stone may be presented as: host rock—fracture—mineralised vein—stabilised section. A stone with a spiral-like motif may be presented as: initial structure—organised curvature—development of a curled pattern—visible stabilised form. Such schemes will help the reader to understand not only the external image, but also a possible sequence of form generation.

For the illustrations accompanying this section, diagrams presenting stone structures in stages would be useful. The first diagram might show the following provisional sequence:

- A is initial nucleus or mass of matter;
- B is primary fracture or layer;
- C is development of layers, veins and deformations;
- D is stabilised stone in section or at the surface (*Fig. 15*).

A second diagram might show a stone with a concentric nucleus, in which the centre and layers may be interpreted as a successive formation (*Fig. 16*).

A third might show a veined stone in which a fracture becomes a mineralised line (*Fig. 17*).

A fourth might present the D → new A scheme: destruction of stone, formation of sediment and the beginning of a new geological cycle (*Fig. 18*).

Such images should be analytical rather than decorative. It is important to demonstrate not only an attractive stone, but also the logic of its stages. If a diagram is used, A, B, C and D may be indicated minimally and carefully. If a photograph is used, its caption should perform an analytical function: ‘A—the initial mass; B—the primary fracture; C—the mineralised vein; D—the stabilised structure’. This approach will make the model comprehensible and prevent it from becoming an unrestricted analogy.

Stone in the A–B–C–D model also concludes the present chapter. In the preceding sections, stone was presented as a morphogenetic body; the concept of lithomorphogenesis was then introduced; waves, layers and folds were examined; and stone was subsequently described as frozen time. It is now clear how all these ideas combine within a unified scheme. Stone possesses

an initial state, passes through differentiation and complexification, stabilises in a visible form and may re-enter the geological cycle. This is the lithomorphogenetic interpretation of the Matrix.

The ultimate meaning is that stone extends the hypothesis of the Matrix beyond living nature. It demonstrates that form may arise not only through biological growth, but also through the physicochemical becoming of matter. Stone form is slow, heavy and stress-laden, frequently concealed and requiring revelation through sectioning, fracture or attentive interpretation of its surface. Yet the same invariants are visible within it: layer, fold, fracture, edge, centre, direction, self-similarity, stabilisation and the cycle of matter.

Thus, stone within the A–B–C–D model is not a biological analogue of the seed, but a geological example of processual form. A is the initial matter or nucleus; B the first differentiation; C the development of internal structure; D the stabilised stone form; and the new A matter incorporated into the next cycle following destruction or transformation. Understood in this way, stone becomes an important level of the Matrix: it demonstrates that even matter appearing motionless may preserve a history of becoming and be interpreted as a form of slow time.

Fig. 1. Stone with Pronounced Internal Layering: Form as the Trace of Long-Term Accumulation and Transformation of Matter

Fig. 2. Stone with Veins and Cracks: Internal Structure as a Record of Stresses, Flows, and Mineralisation

Fig. 3. Stone Wave or Fold: Deformation of a Layer as a Morphological Record of Geological Time

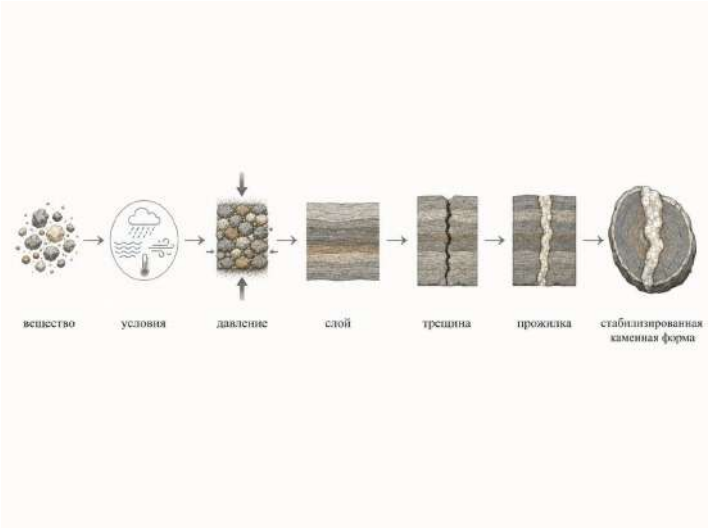

Fig. 4. Scheme of Lithomorphogenesis: Matter — Conditions — Pressure — Layer — Crack — Vein — Stabilised Stone Form

Fig. 5. Stone in Section as an Object of Lithomorphogenetic Reading: Internal Structure, Surface, and Hidden History

Fig. 6. Comparison of Levels of Morphogenesis: Biological Growth of a Leaf and Geological Formation of Stone Structure as Different Types of the Becoming of Form

Fig. 7. Layered Stone Structure: Sequence of Bands as a Trace of Accumulation and Changing Conditions

Fig. 8. Undulating Line in Stone: Movement Stabilised in Structure

Fig. 9. Spiral or Curvilinear Motif in Stone as an Example of Organised Bending

Fig. 10. Folded Deformation of a Layer as a Record of Pressure and Geological Time

Fig. 11. Layered Stone as a Record of Successive Phases of the Formation of Matter

Fig. 12. Veins and Cracks as Traces of Later Processes Superimposed on the Primary Structure

Fig. 13. Stone Fold as a Stabilised Form of Pressure and Geological Time

Fig. 14. Stone as a Multitemporal Structure: Layer, Deformation, Crack, Vein, and Surface

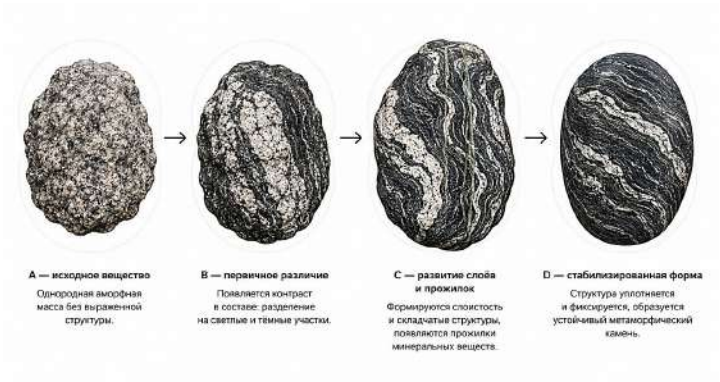

Fig. 15. Stone in the A–B–C–D Model: Initial Matter — Primary Differentiation — Development of Layers and Veins — Stabilised Form

Fig. 16. Concentric Core and Successive Layers as a Conventional Staging of Lithomorphogenesis

Fig. 17. Crack as Stage B and Mineralised Vein as Structural Development at Stage C

Fig. 18. Transition D → New A: Breakdown of Stone, Sediment, and the Beginning of a New Geological Cycle

Chapter Thirteen

Mountain Relief, Folds and the Edges of Terrestrial Form

13.1. Relief as a Surface of Morphogenesis

Following the analysis of stone as a morphogenetic body, it is necessary to proceed to a larger geological scale: terrestrial relief. Whereas an individual stone allows layers, veins, folds, fractures and the internal structure of matter to be observed, relief demonstrates these same processes across the space of the landscape. Here, morphogenesis is no longer concealed solely within a small body, but is unfolded in the form of mountain ranges, slopes, valleys, escarpments, plateaux, faults, channels, scree, glacial landforms and lines of erosion. Relief is a surface upon which geological time becomes visible as space.

In ordinary perception, relief is frequently understood as the external appearance of the Earth's surface: mountains, plains, hills, valleys, slopes, ravines and gorges. For the hypothesis of the Unified Matrix of the Universe, however, relief is important not merely as landscape. It must be considered as an active morphogenetic zone in which the Earth's internal and external forces interact. Tectonic processes uplift, compress, rupture and deform the Earth's crust. Water erodes, transports and deposits material. Gravity causes masses to move down slopes. Wind, ice, temperature, chemical weathering and biological processes alter the surface. Terrestrial form is consequently created, destroyed and restructured continuously.

Relief should therefore not be understood as a passive outer covering of the Earth. It is a boundary at which deep processes encounter surface processes. Tectonic movements, uplift, compression, faults, magmatism and isostatic adjustments act from below. The atmosphere, water, glaciers, temperature fluctuations, weathering, erosion, sedimentation and biological influences act from above. Relief arises at the intersection of these forces. It is not merely a surface, but a zone of conflict, equilibrium and transition between the internal and external.

In this sense, the Earth's surface is closely related to the concept of the active edge previously examined at the botanical level. In the leaf, the edge is a zone of growth and interaction with the environment. In the petal, the edge records unfolding and form. In the succulent, the edge of a leaf module represents the boundary of protection and exchange. In relief, the Earth's surface itself becomes the active edge. Here, the deep structure emerges into the external world and external forces begin to rework it. Relief is the edge of the planetary body, but an edge that is morphogenetically active rather than passive.

The analogy with a leaf or petal must, however, remain limited. The Earth's surface is not a biological organ. Mountains do not grow like leaves, valleys are not veins, and folds in relief are not literally petals. At the level of morphological logic, however, similar relationships may be observed: axis, edge, fold, layer, branching, surface, section, flow, deformation and the revelation of structure. These relationships arise in different materials and through different mechanisms, but may be described using a shared language of form.

Relief is particularly important to the Matrix because it demonstrates morphogenesis on a scale exceeding that of an individual body. A stone is a fragment. A mountain is a system. A range is a

direction. A valley is an axis of drainage and an incision into the surface. A mountain fold is the deformation of large masses of matter. A gorge is a line of deep incision. A plateau is a stabilised surface. A sedimentary plain is a zone of accumulation. The Earth's surface is therefore a vast morphogenetic map across which forms are distributed in space and time.

Relief develops through two simultaneous processes: uplift and destruction. Tectonic forces may uplift mountain systems, compress rocks and create folds and faults. At the same time, water, ice, wind and gravity destroy the uplifted forms, dissect them with valleys, transport material and create new deposits. Relief is consequently never solely the result of construction or solely the result of destruction. It arises from their interaction. A mountain is uplifted and eroded simultaneously. A valley deepens because the surface both resists and yields to the flow. A slope forms through uplift, weathering and the gravitational movement of material.

This interaction makes relief particularly important to the philosophy of form. Here, form emerges not as pure unfolding, but through the conflict of processes. Tectonics creates elevation, which erosion subsequently reworks. Pressure creates a fold, which weathering exposes at the surface. A fault disrupts integrity, and water uses this zone of weakness to form a valley or gorge. A layer first forms as a sedimentary or metamorphic structure and is then uplifted, bent, dissected and exposed. Relief demonstrates that form may be the outcome of the repeated superimposition of processes.

Unlike stone, in which morphogenesis is frequently interpreted through a section, relief reveals structure across space. Mountain ranges, valleys, escarpments and folds may be visible as large lines of the Earth's surface. Their interpretation nevertheless also requires attention to depth. What appears to be a simple mountain may be the outcome of a complex tectonic history. What appears to be a beautiful valley may be a zone of prolonged erosion, glacial incision or river drainage. What appears to be the serrated edge of a ridge may be a trace of erosion, frost weathering, faulting and variations in rock resistance.

Relief should be considered as a surface of morphogenesis precisely because it combines the visible with the concealed. A visible slope may be the surface expression of an internal stratum. A visible ridgeline may correspond to rock structure, the direction of a fold or the resistance of the material. A visible valley may follow a fault or zone of weakness. A visible drainage network may reflect surface inclination, rock composition, climate and the history of erosion. The Earth's surface is therefore not merely an external contour, but a manifestation of internal and external relationships.

Within the model of the Matrix, relief broadens the concept of the surface. At the botanical level, the leaf surface was a zone for exchanging light, air, water and organic matter. At the geological level, the Earth's surface is a zone for exchanges of energy, matter and force among the lithosphere, atmosphere, hydrosphere, cryosphere and biosphere. Here, water makes the solid mobile, temperature breaks down rock, plant roots contribute to weathering, glaciers abrade and transport material, and gravity carries fragments downslope. The surface of relief is an open system.

This openness is fundamental. Relief is not formed solely from within the Earth or solely from outside it. It is the outcome of interaction. Tectonic uplift without active erosion produces one type of form. Powerful erosion without significant uplift produces another. In a humid climate, a drainage network develops differently from one in an arid climate. Glaciers create their own landforms. Where rocks vary in resistance, relief becomes selective: some areas are eroded more rapidly, while others persist for longer. Relief is therefore a form highly responsive to conditions.

In this respect, relief continues the theme of lithomorphogenesis, but extends it from the small body into the landscape. Stone records processes within a compact volume. Relief records processes across extensive surfaces. Stone may be an archive of pressure and crystallisation. Relief is an archive of uplift, erosion, faulting, drainage, mass wasting, glacial movement and prolonged interaction between the environment and rock. Stone and relief are both forms of geological memory, but the memory of relief is distributed across space.

Relief also demonstrates that morphogenesis may be multiscale and multilayered. At the first level, the overall configuration of a mountainous region is visible: ranges, valleys, plateaux and basins. At the second level, individual slopes, ridges, escarpments, channels and terraces appear. At the third, fractures, scree, grooves, layers and erosion gullies become visible. At the fourth, the texture of the rock, soil and individual stones may be observed. Terrestrial form contains nested levels. What constitutes a mountain range at one scale becomes a line of edge at another; what constitutes a valley at one scale may become a system of lateral ravines and tributaries at another.

This multiscale character makes it possible to speak of relief as a geological form displaying features of natural self-similarity. Drainage networks, systems of ravines, branching valleys, fracture lines, mountain ridges and erosion structures may demonstrate the recurrence of similar relationships across different scales. As with stone, however, caution is required. Not every complex surface is fractal. Not every branching valley is equivalent to the vein of a leaf. Morphological self-similarity or scale hierarchy may be identified when recurring structures are genuinely observable: principal axes, lateral branches, smaller ramifications, active edges and distributed flows.

Water occupies a special position in relief. It is one of the principal agents of terrestrial morphogenesis. It erodes, dissolves, transports, deposits, deepens, smooths and incises. A river transforms a slope into a valley, a valley into a system of tributaries, a mountain into a source of sedimentary material and a plain into a zone of accumulation. Water creates lines across the surface. These lines may be compared with leaf veins only at the level of the morphological functions of distribution and direction: both form networks, but one is a living tissue and the other a hydrological and erosional process.

Gravity is another fundamental agent of relief. Everything uplifted tends to be redistributed downwards. Slopes shed material, fragments fall, avalanches move, glaciers descend and streams carry matter into valleys. Gravity gives relief direction. Up and down become not merely spatial orientations, but morphogenetic poles. A mountain does not exist without slopes, a slope does not exist without a downward direction, and a valley does not exist without drainage. Relief is therefore a form organised by verticality.

The verticality of relief is particularly important to the Matrix. In a plant, the vertical is frequently associated with the stem, axis of growth and upward movement towards light. In relief, verticality is connected with elevation, uplift, gravity, flow energy and the potential for destruction. The higher a form is uplifted, the greater its potential energy and the more active the processes of erosion and transportation may become. Elevation is not merely a geometric feature, but a factor in morphogenesis. Mountains are therefore not simply high forms; they are active systems for the reworking of matter.

Tectonics introduces deep stress into relief. Mountain systems frequently arise from compression, plate collision, uplift, faulting, folding, volcanism and other processes of the Earth’s internal dynamics. At the surface, these processes manifest themselves as ranges, folds,

escarpments, ruptures, fault lines, uplifted blocks and downthrown basins. Tectonics creates the primary large-scale architecture that external forces subsequently rework. Relief may therefore be understood as the outcome of a dialogue between tectonic uplift and denudational erosion.

Erosion, in turn, does not merely destroy relief, but organises it. It selects zones of weakness, deepens drainage lines, forms valleys, exposes strata and creates escarpments and terraces. Erosion makes the concealed visible. It may remove overlying layers and reveal the internal structure of mountains. It may dissect folds and expose their profiles. It may remove material and transport it elsewhere. Destruction therefore once again becomes a form-generating process. Relief arises not despite destruction, but through it.

In this respect, relief is a spatial analogue of a section through stone. Stone may be cut to reveal its internal layers. The Earth's surface may be 'cut' by a valley, gorge, canyon, ravine, fault or glacial trough. This is not, of course, a human section, but a natural process. Morphologically, however, it performs a similar function: it reveals depth. A valley demonstrates not only the surface, but also internal layers, exposures, folds and geological boundaries. A valley may therefore be understood as an axial line through which relief is revealed.

Relief also demonstrates the importance of the edge. A mountain crest, rocky escarpment, cliff line, plateau edge, fault scarp, moraine ridge, coastline and glacier margin are all active geomorphological boundaries. They separate an elevation from a depression, resistant rock from eroded material, a surface from a section, a slope from a valley, and a plateau from an escarpment. The edge of relief may be serrated, undulating, ruptured, stepped, sharp or smoothed. It records the interaction of structure and destruction.

The serrated character of relief is particularly important for subsequent analysis. Mountain peaks, sharp crests, rock ribs, eroded escarpments and fractured edges may morphologically resemble the serrated edge of a leaf or petal. The difference between their mechanisms must once again be maintained. In a leaf, a serrated edge is connected with tissue growth, venation and biological organisation. In a mountain, it may result from weathering, varying rock resistance, glacial action, fracturing, rockfalls or tectonic structure. What they share is not a cause, but the morphological feature of an active, heterogeneous periphery.

Relief as a surface of morphogenesis is also connected with the concept of the fold. In the preceding chapter, the fold in stone was considered as the recorded deformation of a layer. In relief, the fold may be expressed at the scale of a mountain system. Fold mountains demonstrate how large masses of rock were compressed and bent, and subsequently uplifted and exposed by erosion. At the surface, this folding may appear as recurring ridges and valleys, undulating lines of strata and curves within mountain structures. The Earth's surface becomes the visible plane of deep deformation.

It is here that the connection with petal logic arises, which will be examined in detail in the following section. A flower petal is an unfolded surface that was once a layer. A mountain fold may morphologically resemble a large curve within a layer exposed at the surface. Both display curvature, edge, surface, direction and rhythm. Their biological and geological natures, however, differ. One should therefore speak not of an identity between a petal and a mountain fold, but of the possibility of comparing them as different manifestations of the invariant of the folded surface.

Relief is also a form in which time is expressed through elevation and depth. The height of a mountain may result from uplift. The depth of a valley may result from incision. The width of a

valley may result from prolonged widening, glacial action or lateral erosion. Terrace steps may record former river levels or phases of incision. A plateau surface may be the remnant of an ancient levelled surface. A ravine may indicate a young, active process. Relief therefore contains different ages and rates within one spatial system.

This multitemporality makes relief a particularly complex object. Ancient stable surfaces, young incisions, active scree, modern channels, old terraces, recent rockfalls, glacial traces and tectonic structures may coexist within a single landscape. Relief does not belong to one time. It constitutes a set of temporal layers. Just as stone may contain a layer, fracture, vein and surface belonging to different phases, a landscape may contain a range, valley, escarpment, channel and scree belonging to different processes and ages.

Relief may therefore be called a multitemporal surface. It not only occupies space, but also contains history. A slope may be old, while a ravine cut into it is young. A range may result from ancient uplift, while scree at its foot results from recent destruction. A valley may have been inherited from past climatic conditions, while the modern river occupies it only partially. Relief consequently requires historical as well as geometric interpretation.

This is important to the hypothesis of the Matrix because universal invariants of form manifest themselves not within one moment, but through prolonged becoming. The axis of a valley, the edge of a ridge, the fold of a mountain stratum, the network of tributaries, the steps of terraces and the surface of a plateau are not static figures, but traces of processes. At the geological level, the Matrix must be understood as a processual organisation in which form is the outcome of forces, time and material.

Relief also demonstrates the relationship between stability and instability. A mountain form may appear stable, but its slopes are changing continuously. Rocks fracture, fragments fall, snow and ice move, water incises, vegetation retains or disrupts soil, and wind transports fine material. The stable appearance of relief conceals constant microdynamics. Relief is therefore only relatively stable. It is stable on one timescale and mutable on another.

This brings relief closer to stone as ‘frozen time’. Stone appears motionless, but is the result of processes. A mountain appears motionless, but likewise participates in processes. The difference is one of scale: a mountain is an open system in which processes may be continuously visible at the surface. Stone more often preserves process internally. Relief demonstrates process at the boundary between the Earth and its environment. It may therefore be regarded as an open form of geological time.

The role of material is especially important in relief. Different rocks resist erosion differently. Resistant rocks may form rocky outcrops, ridges and escarpments. Softer or more heavily fractured rocks erode more rapidly, creating depressions, scree and gentler slopes. Relief consequently becomes a selective representation of the internal geological structure. The surface demonstrates that concealed matter possesses varying resistance. The form of relief depends not only upon force, but also upon the material’s resistance.

Material resistance is an important morphogenetic factor. If all rocks eroded in the same manner, relief would be much more uniform. Differences in resistance create contrast: ridge and hollow, escarpment and slope, cliff and scree, mountain range and valley. In this sense, relief arises from difference. Differences in material, pressure, elevation, moisture, fracturing and climate all become sources of form. This corresponds to the general logic of the Matrix: form begins where homogeneity is disrupted.

Within the A–B–C–D model, relief may be interpreted provisionally. Stage A is the initial surface or rock mass before pronounced dissection. Stage B is the primary disruption: uplift, faulting, a fracture, an initial drainage line, the first escarpment or the beginning of a fold. Stage C is structural development: the formation of ranges, valleys, slopes, drainage networks, scree, folded lines and erosional landforms. Stage D is the stabilised relief configuration: a mountain system, valley network, mature slope or exposed folded structure. D may subsequently pass into a new A through destruction, transportation and sedimentation. This scheme must, however, remain analytical rather than literal.

Relief demonstrates stage C particularly clearly because this is the stage at which complexity emerges. Initial uplift or faulting does not yet create the entire form. The form develops as water begins to incise, slopes erode, rocks become exposed, tributary networks become more complex, boundaries are eroded, and material is transported and deposited. Stage C of relief is a prolonged phase of dissection, differentiation and reworking of the surface. Terrestrial form becomes legible precisely through this complexity.

Stage D in relief is likewise relative. It cannot be said that relief is ever definitively complete. It is nevertheless possible to speak of a temporarily stable state: a developed mountain system, mature valley, stabilised slope, plateau, plain or coastline. Such a form may persist long enough to become a landscape structure, but it remains open to further change. D in relief is therefore not an end, but a temporary morphological stabilisation.

Relief as a surface of morphogenesis is also important for connecting geology with visual thought. Mountains, valleys and ranges are perceived as images. They may resemble folds of fabric, petals, waves, leaf veins, roots, networks, lines of the palm or flows. Scientific and philosophical analysis, however, must proceed beyond the image. It must ask: What constitutes the axis? Where is the edge? Where is the fold? Where has the surface been exposed? Where does flow operate? Where is erosion visible? Where is pressure recorded? Where does the material resist? Where does form stabilise? Only then does the landscape become an object of morphogenetic analysis.

Relief also has particular significance for subsequent visual comparisons within the book. The visual pair ‘flower petal—folded mountain relief’ may be highly expressive, but it must be discussed correctly. Such a comparison should demonstrate not biological kinship, but a similarity of morphological logic: recurring folds, undulating edges, exposed surfaces, axial directionality, the rhythm of layers and the interaction between centre and periphery. Relief must preserve its geological autonomy within this comparison.

Relief also demonstrates how the Matrix manifests itself not only at small, but also at large scales. A leaf vein and a river valley differ, but both demonstrate the role of a line of distribution. A petal fold and a mountain fold differ, but both display the curvature of a surface. A serrated leaf edge and a serrated mountain crest differ, but both demonstrate an active periphery. Succulent layering and mountain strata differ, but both demonstrate a sequence of levels. Such parallels become productive only when the differences between mechanisms are clearly preserved.

Relief as a surface of morphogenesis is also connected with the concept of revelation. The Earth’s surface reveals deep structures through uplift, destruction and erosion. What was once internal becomes external. Folded strata may become exposed upon a slope. A fault may become a line of relief. Differences in the internal resistance of rocks may become visible as contrasts between cliffs and depressions. Relief is geology revealed. Here, however, revelation occurs not through gentle opening, but through prolonged destruction, uplift and exposure.

This makes relief a more forceful and large-scale form of the Matrix. Whereas the flower unfolds its petals, mountains reveal strata through erosion. Whereas a leaf unfolds a plane, a valley dissects a surface. Whereas the fern demonstrates the fractal hierarchy of living form, a drainage network demonstrates a scale hierarchy of drainage and erosion. Whereas the succulent accumulates layers around a centre, a mountain system may display a complex superimposition of strata, uplift and erosion. All these parallels operate only as a morphological language rather than as assertions of identity.

The Earth's surface also demonstrates that morphogenesis may be distributed. A plant possesses an organism as a whole. A stone possesses an individual body. In relief, the whole is less evident. Where does one form end and another begin? A mountain passes into a slope, the slope into a valley, the valley into a channel, the channel into a plain and the plain into the sea. Relief is a continuous system. Its elements are distinguished analytically, but in nature they are connected by transitions. This makes the geomorphological level particularly complex for the Matrix: here, form does not always possess a clearly defined boundary.

The category of the edge is therefore particularly important. In relief, the edge helps identify a form: a crest separates one slope from another; an escarpment separates an upper surface from a lower one; a shoreline separates land from water; a fault separates blocks; and a valley side separates the slope from the floor. These edges may be eroded, destroyed, displaced or smoothed. The edge of relief is not merely a contour, but a process. It forms, changes and disappears.

Relief also demonstrates the role of energy. Elevation, gradient, flow velocity, the mass of debris, rainfall intensity, glacier velocity and wind strength are all energetic parameters of morphogenesis. The form of relief depends upon the distribution of energy. A steep slope erodes more actively, a rapid flow incises more deeply, a powerful glacier abrades more intensely, and pronounced temperature fluctuations break down rock more rapidly. Relief is therefore not only a geometry, but also an energetic field.

In this sense, relief may be considered as a visible diagram of forces. A ridge demonstrates uplift and resistance. A valley demonstrates the direction of drainage and incision. An escarpment demonstrates differences in elevation and resistance. Scree demonstrates the action of gravity. A terrace indicates a former level of flow or surface. A fold demonstrates pressure. A fault demonstrates disruption of integrity. Relief speaks in the language of forms, but every form is underlain by force.

This is of fundamental importance to the hypothesis of the Matrix. The Matrix should not be understood as a collection of beautiful contours. It should be understood as a system of relationships in which form is a trace of forces and processes. Relief demonstrates this with particular clarity: its form does not exist separately from tectonics, erosion, water, gravity and time. The geological level of the Matrix is therefore the level of force, resistance and duration.

Relief also demonstrates that form may remain open and incomplete. A mountain continues to erode. A valley continues to deepen or ffig. A river changes its course. A slope sheds material. A coastline retreats. A glacier leaves a trace and disappears. Relief is therefore not a completed sculpture, but a processual surface. Human beings perceive it as landscape, but what they actually see is a moment within prolonged becoming. This is one of the principal conclusions of the section: the Earth's surface is not a background to life, but an active morphogenetic system.

Relief as a surface of morphogenesis may be described through several analytical categories. The first is structure: ranges, valleys, strata, faults and folds. The second is process: uplift, erosion, transportation, weathering, mass wasting and glacial movement. The third is material: resistant and soft rocks, fracturing, composition and durability. The fourth is energy: elevation, gradient, gravity, flow and climate. The fifth is time: ancient surfaces, young incisions, active processes and stabilised forms. The sixth is scale: from a mountain system to an individual fracture. These categories make it possible to interpret relief as a morphogenetic field.

For the illustrations accompanying this section, it is important to present not merely an attractive mountain landscape, but a surface upon which processes are visible. The first image may demonstrate mountain relief with clearly defined ranges and valleys as an active surface of morphogenesis (*Fig. 1*). The second may show a slope or mountain face upon which strata, folds and lines of erosion are visible (*Fig. 2*). The third may be a diagram of the interaction among tectonics, water, gravity and erosion in the formation of relief (*Fig. 3*). Such a series will immediately establish the scientific and philosophical framework of the chapter.

A diagram presenting the Earth's surface as a zone of intersection between internal and external forces may be particularly useful. Tectonic uplift and pressure may be shown below; precipitation, water, ice and weathering above; gravitational transportation along the slope; river drainage within the valley; and erosion and exposure of strata at the surface. Such a diagram would help the reader understand that relief is not a static image, but a dynamic boundary between processes.

Relief is therefore an active surface of morphogenesis rather than a passive outer covering of the Earth. Tectonics, pressure, erosion, water, gravity, climate, material and time all operate within it. The Earth's surface records their interaction through mountains, valleys, folds, edges, faults, slopes, channels and exposures. Relief demonstrates that the geological Matrix is revealed not only within stone as a small body, but also within landscape as a vast surface upon which prolonged processes become visible form.

13.2. Mountain Folds and Petal Logic

Mountain folds are among the most expressive manifestations of geological morphogenesis. Within them, the Earth's surface demonstrates not only elevation, mass and relief, but also an internal history of pressure, compression, curvature and subsequent exposure. Folded mountain relief may be perceived as a vast surface upon which the deep deformation of matter has become visible form. Mountain folds therefore occupy a distinctive place within the hypothesis of the Unified Matrix of the Universe: they make it possible to compare geological form with biological forms considered previously—above all, flower petals, leaf folds and the undulating edges of plant structures.

Such a comparison must be made with the utmost caution. A mountain fold is not literally a petal. It does not arise from living tissue, unfold during flowering, or possess a biological function in attracting pollinators or participating in plant reproduction. A petal and a mountain fold belong to different levels of reality, different materials and different mechanisms of formation. The petal is an organ of a living plant; the mountain fold results from geological processes associated with pressure, tectonics, deformation and erosion. At the level of morphological language, however,

a particular structural affinity may be perceived between them: curvature, layer, edge, wave, rhythm, unfolded surface and the transition from an internal structure to visible form.

In this section, petal logic denotes not a biological identity, but a particular mode of interpreting a folded surface. In the preceding chapters, the petal was considered as a former layer that becomes a visible element of the flower through unfolding. It possesses a base, surface, edge and curvature, and may also possess undulation, folds or a radial position around a centre. A mountain fold may similarly be understood as a layer that has been deformed, uplifted, bent and partially exposed at the surface. In both cases, form becomes legible through the curvature of a layer and its active periphery.

The principal morphological invariant here is the fold. In biology, a fold may be connected with growth, protection, packing and subsequent unfolding. A bud contains folded petals; a young leaf may be rolled; and a fern frond unfolds from a spiral curl. In geology, the fold arises differently: rock strata undergo compression, bend, deform and sometimes rupture, after which they may be uplifted and exposed by erosion. In both cases, however, the fold demonstrates that form is neither flat nor simple. It contains internal depth, stress and history.

The mountain fold is particularly important because it makes the plasticity of the Earth's crust visible across geological time. To human perception, rocks appear hard, immobile and resistant. Under immense pressures and temperatures over prolonged periods, however, deformation may bend, compress and restructure strata. What appears immobile within a short timescale may behave as a mutable mass over geological time. A mountain fold is a trace of this slow plasticity. It demonstrates that even the solid may be bent by time and force.

The petal, by contrast, demonstrates the soft plasticity of living tissue. It grows, expands, bends, changes position and opens from the bud. Its surface is thin, functional and frequently coloured, and is connected with the plant's life cycle. Its folding and undulation nevertheless also demonstrate that form does not arise as a flat scheme, but as a surface interacting with stress, growth and edge. The petal is a living fold. The mountain fold is a lithospheric fold. They do not possess a common mechanism, but they do share a morphological principle: a surface may be organised through the curvature of a layer.

The visual pair 'flower petals—folded mountain relief' may therefore become an important illustrative device within the chapter. If a close-up of petals is placed alongside a photograph of a folded mountain range, recurring lines may be observed: undulating edges, diverging surfaces, overlapping layers, a rhythm of curves, and a transition from a centre or base towards the periphery. The caption to such a pair must, however, be precise. It should not state that mountains are literally the petals of the Earth. It would be preferable to say: 'Morphological comparison of petal folding and folded mountain relief: different mechanisms, similar invariants of curvature, layer and edge'.

Petal logic helps reveal not only mass, but also surface within mountain relief. A mountain is frequently perceived as a volume or uplifted mass. Folded relief, however, demonstrates a surface possessing curves, waves, edges, transitional lines, layers and exposed planes. When a mountain slope or range is considered as a morphogenetic surface, not only elevation and scale, but also the structure of curvature become important. The fold makes the mountain legible as a process rather than merely as an object.

Mountain folds frequently form a rhythm. One fold may be followed by another; a ridge may pass into a valley; a layer may curve upwards and downwards; and undulating lines may recur

throughout the landscape. Such rhythm resembles the repetition of petals, although only at the morphological level. Within the flower, petals may be arranged around a centre to form a radial composition. In mountains, folds are more often connected with the direction of pressure, tectonic lines, rock structure and subsequent erosion. In both cases, however, repetition creates a legible form. Rhythm is one means through which numerous elements become a whole.

The axes of folds are especially important in folded mountains. A fold possesses a direction around which the strata bend. This axis may be expressed within relief as a ridgeline, the direction of a valley, the recurring contour of strata or a structural line within the mountain system. In a petal, the axis may be connected with the central vein, base and direction of unfolding. Another morphological correspondence thus arises: the surface is organised not chaotically, but around a direction. The axis allows the fold to become a form rather than an accidental curve.

Petal logic also helps reveal the importance of the base. A petal possesses a base through which it is connected with the flower. It unfolds outwards from that base. A mountain fold likewise possesses a deep foundation: strata and structures extending into the body of the Earth. At the surface, only part of this structure is visible. A slope or ridge is the visible expression of a deeper geological organisation. Like the petal, therefore, the mountain fold should not be considered solely through its outer edge. Its form is connected with an internal support.

This becomes particularly expressive in exposures. When curved strata are visible on a mountain slope, the surface of relief resembles an open page of geological time. A stratum that was once part of an internal rock mass becomes visible. Erosion exposes it as the surface of a petal becomes exposed through unfolding. In geology, however, such exposure is connected not with growth, but with destruction and denudation. Methodological precision lies in recognising this distinction: morphologically, the layer becomes visible; genetically, it becomes visible through an entirely different process.

Petal logic is particularly useful when analysing mountain slopes on which strata form fan-shaped, arcuate or undulating patterns. Such forms may resemble open petals or folded surfaces. Visually, they demonstrate that relief is not a simple line of the horizon. It consists of surfaces that have been uplifted, bent, truncated, eroded and exposed. In such cases, mountain relief may be described as a large-scale folded surface.

Attention must also be paid to the distinction between a fold as a geological structure and the folded appearance of relief. Not every undulating mountain is a geological fold in the strict sense. Undulating relief may result from erosion, differences in rock resistance, glacial action, landslides or other processes. The text must therefore distinguish between a geological fold in the strict sense and morphologically folded relief. Within the hypothesis of the Matrix, one may speak of a ‘folded motif’ or the ‘folded logic of a surface’ when the precise geological mechanism has not been established.

This distinction is crucial. The visual resemblance of relief to petals must not automatically become a claim of tectonic folding. Where curved strata are visible in a photograph, it is possible to speak of a folded structure. If only the undulating line of a ridge is visible, it is preferable to speak of an undulating or folded silhouette of relief. If edges, escarpments and recurring crests are visible, one may speak of the rhythm of an active periphery. Such language preserves analytical precision.

The mountain fold also demonstrates the relationship between form and pressure. A petal opens through growth and tissue processes; a mountain fold arises through pressure and deformation.

Geological pressure does not merely destroy. It may organise form. The compression of strata produces curves, waves, anticlines and synclines, and complex folded structures. Pressure transforms a horizontal or less differentiated sequence of strata into a three-dimensional architecture. The mountain fold is therefore one of the clearest examples of stress becoming form.

In this sense, the mountain fold continues the theme of stone as ‘frozen time’. Whereas a fold in stone may be visible as a pattern within a small body, in mountains it becomes a landscape. A human being may walk across the fold and perceive it as a slope, valley, crest, precipice or line of the horizon. A geological fold becomes space. This represents the transition from lithomorphogenesis to geomorphogenesis: the same logic of deformation, but at the scale of the Earth’s surface.

Petal logic helps communicate this transition to the reader through a visually intelligible image. A petal is readily perceived as a thin, curved surface. If a mountain slope containing curved strata is then shown, the reader begins to perceive not merely a ‘mountain’, but a surface possessing a fold, edge and internal layer. Such comparison is useful pedagogically. It creates a bridge from a familiar biological form to a complex geological form. The bridge must, however, be constructed with precise qualifications.

Visual pairs play an important role within the hypothesis of the Matrix. They demonstrate that the same morphological invariants may be recognisable at different levels. A visual pair is not, however, evidence of causal unity. It is an instrument for identifying structural correspondence. Within the pair ‘petal—mountain fold’, such correspondences include surface, layer, curvature, edge, undulation, directionality, rhythm and the revelation of the internal within the external. The mechanisms remain different: biological growth and geological deformation.

The mountain fold also demonstrates the relationship between layer and edge. When a layer bends and is subsequently exposed, its edge may become part of the relief. Escarpments, crests, cliffs and the lines of strata upon slopes are all edges revealing internal structure. In the petal, the edge is the external limit of the plant surface. In the mountain, an edge may be the line along which a layer is exposed, a line of destruction, a boundary of resistant rock, a fracture or an escarpment. The geological edge is therefore frequently not original, but produced through exposure and erosion.

This makes the mountain edge particularly complex. It may simultaneously be structural and erosional. It is structural because it is connected with an internal stratum or fault. It is erosional because it became visible through destruction of the surface. In a petal, the edge forms as part of the organ. In mountain relief, the edge frequently forms through the interaction of internal structure and external force. Petal logic must therefore be supplemented here by the geological logic of exposure.

Mountain folds may also be considered as forms of revelation. This revelation, however, is neither gentle nor organic. It occurs through uplift, compression, destruction, incision and exposure. The internal structure of the Earth’s crust becomes a surface. A layer that was once inside appears upon a slope. A fold that arose at depth becomes a line within the landscape. In this sense, mountains reveal the Earth, but their revelation is connected with force and time rather than with a life cycle.

The petal opens from the bud. The mountain fold is revealed from geological depth. This comparison may be employed philosophically, but only cautiously. In both cases, visible form

follows a concealed state. In the first, however, concealment is biological and potential; in the second, it is deep and geological. The petal is directed towards the function of the flower, whereas the mountain fold is directed towards stabilisation and subsequent erosion of relief. Only the logic of transition from concealed structure to visible surface is shared.

The category of the former layer is particularly important in this connection. In the flower, the petal was folded within the bud before becoming a visible element of the open corolla. In mountain relief, a rock stratum may once have formed part of an internal geological mass and subsequently been deformed, uplifted and exposed by erosion. In both cases, the visible surface retains the memory of a preceding state. The petal preserves the memory of the folded bud; the mountain fold preserves the memory of pressure and depth. These are, however, different types of memory: biological and geological.

The mountain fold also demonstrates that a surface may result from an internal force. What is visible in relief frequently possesses a deep cause. A slope, ridge, cliff or valley may be connected with rock structure, faults, the inclination of strata or variations in material resistance. The mountain surface is therefore not accidental. It expresses an internal architecture, although one reworked by external processes. The petal surface similarly expresses the internal organisation of tissue and venation. Another shared invariant consequently emerges: the surface as a manifestation of internal structure.

Petal logic may also be useful for analysing mountain systems in which ridges diverge in a fan-shaped arrangement. Some mountain reliefs display diverging folds resembling unfolded plates or petals. In such cases, it is possible to speak of a fan-shaped or petal-like composition of relief where the description refers to external morphology. It cannot, however, be claimed without further evidence that the relief is ‘constructed according to a floral scheme’. It is more accurate to say that ‘morphologically, the relief demonstrates a petal-like unfolding of folded surfaces’.

The rhythmic periphery is an important element of the comparison. In a flower, the periphery is formed by the edges of petals. It may be smooth, undulating, serrated, irregular or asymmetrical. In mountain relief, the periphery is expressed through crests, escarpments, rocky edges and serrated ridgelines. In both cases, the edge demonstrates not a static contour, but an active zone of interaction. The petal interacts with light, air, moisture and the biological environment. The mountain edge interacts with weathering, water, ice, gravity and destruction.

Undulation is likewise a shared morphological motif. A petal may possess an undulating edge or a gentle fold across its surface. Mountain relief may possess undulating ranges, folded strata and curving lines of slopes. Undulation within living tissue and rock possesses different causes, but visually both demonstrate a transition from straightness to rhythmic curvature. Undulation is a form in which the line acquires movement. In geology, that movement becomes frozen within relief; in biology, it participates in growth and unfolding.

The mountain fold also helps refine the concept of the ‘slow petal’ as a metaphor rather than a term. It may be said that mountain relief sometimes morphologically resembles gigantic open petals, but this is only an image used to explain form. Scientifically, it is more accurate to speak of folded surfaces, the fan-shaped arrangement of ridges, the rhythmic structure of strata and active edges. A metaphor may help the reader perceive, but must not replace description. The term ‘petal logic’ is therefore best employed within the principal text as a morphological rather than biological category.

Petal logic includes several features. The first is the presence of a surface that may be interpreted as unfolded or exposed. The second is the layer or stratum underlying that surface. The third is a curve or fold disrupting the plane. The fourth is an edge at which the surface encounters the environment. The fifth is the rhythm created by recurring folds or edges. The sixth is directionality from a base, axis or internal structure towards the periphery. These features may be identified in both a petal and mountain relief, although in different material modes.

Within mountain relief, these features manifest themselves through the ridge, slope, valley, fold, stratum, exposure and line of the horizon. The surface is the slope or mountain face. The layer is the geological stratum or rock structure. The curve is the fold or undulating deformation. The edge is the crest, escarpment, precipice or fault line. Rhythm is the repetition of ridges, folds, strata and escarpments. Directionality is the fold axis, valley direction, ridgeline or vector of erosion. Petal logic may therefore be translated into the language of geomorphology.

Erosion plays a distinctive role. Without erosion, many folded structures would remain concealed. Erosion cuts, reveals, differentiates and emphasises resistant and weak zones. In this sense, erosion performs the function of an ‘agent of revelation’. It does not originally create the fold, but makes it visible, transforming internal deformation into a form of relief. In biology, the petal unfolds from within the plant; in geology, a fold is frequently revealed through external destruction. This distinction must be preserved consistently.

Mountain folds also demonstrate the relationship between surface and depth through exposure. Lines of strata visible upon a slope continue into the mountain. The observer sees only the surface, but understands that it is connected with volume. The petal likewise possesses a surface and internal tissue, but its depth is small and biologically organised. A mountain fold possesses immense depth connected with masses of rock and the history of the Earth’s crust. Similarity between surfaces therefore does not eliminate differences of scale.

Scale is one of the principal differences between a mountain fold and a petal. A petal may be held in the hand, observed as a whole and seen moving. A mountain fold may extend across kilometres. It cannot be observed in its entirety from the ground; an aerial view, geological map, section or satellite image may be required. The mountain fold therefore requires multiscale thought. A visual pairing with a petal helps reveal the form, but scientific understanding requires a transition to cartographic and geological scales.

This is particularly important for illustrations. A comparative illustration should not merely present an aesthetic pair of ‘petal—mountain’, but should, where possible, also indicate their difference in scale. A close-up of petals may be placed on the left and folded mountain relief with visible strata and ridges on the right. The shared invariant—the fold of the surface—may be shown between them. The illustration should not, however, suggest that they are the same structure. A preferable caption would be: ‘Comparison of the morphological invariant of the fold: petal surface and folded mountain relief’.

The mountain fold also demonstrates that form may be only partially exposed. Frequently, only a fragment of a fold is visible at the surface. The remainder is concealed, destroyed, covered by sediment or inaccessible to observation. A petal is usually visible in its entirety, although its internal structure may require magnification. Geological form is more frequently fragmentary. The analysis of mountain folds is therefore invariably connected with reconstruction. The researcher observes a part and must cautiously reconstruct the whole.

This fragmentary character makes mountain folds particularly similar to ancient artefacts and stone fragments that will be considered in later parts of the study. We rarely possess the complete form. We observe an exposure, a section of slope, a fragment of a range, an image or a geological section. The visible motif must therefore be distinguished from the inferred structure. Petal logic should not lead us to complete a mountain imaginatively as a flower. It should merely help identify the principle of folding within the visible material.

Mountain folds also demonstrate that form may result from two opposing directions: compression and revelation. First, strata are compressed and bent. They are then revealed at the surface through uplift and erosion. The biological petal similarly possesses a concealed and an open phase, but there compression is connected with packing within the bud and unfolding with growth and development. In mountains, compression is tectonic and revelation erosional. The general morphological scheme 'concealed—compressed—revealed' applies, but its content differs.

This relationship fits particularly well within the A–B–C–D model. For the petal, A is the concealed layer within the bud; B the beginning of opening; C the unfolding and differentiation of the surface; and D the open petal. For the mountain fold, A is the initial stratum or rock mass; B the beginning of pressure or bending; C the development of the folded structure; and D the exposed and stabilised relief form. A new A may arise through destruction, sedimentation and a new geological cycle. The same model may therefore be applied at different levels, but with different content assigned to the stages.

Petal logic also highlights the role of the edge within folded relief. The edge of a fold may be a crestline, valley side, precipice, projecting stratum or fault zone. This edge is frequently the most active part of the form: it erodes, collapses, weathers, becomes a drainage line or marks a boundary of resistance. The edge of a petal is likewise active: it completes the surface and may be undulating, serrated, thin or coloured. What they share is the peripheral expressiveness of form.

The mountain edge is frequently serrated and fractured. This is especially evident in high mountains, where frost weathering, glaciers, fracturing and rockfalls create sharp ridges and peaks. Such an edge may morphologically resemble a serrated leaf edge or dissected petal. The mechanism, however, is again different. The serration of relief results from erosion and material resistance rather than the growth of living tissue. The subsequent section on serrated edges of relief should therefore continue this line of analysis: an active edge may be living, lithic or geomorphological.

Mountain folds also demonstrate that a layered surface may be simultaneously beautiful and stress-laden. The visual beauty of folded mountains is frequently connected with the rhythm of lines, light and shadow, recurring ridges and waves of strata. This beauty, however, should not obscure the origin of the form: pressure, compression, destruction and erosion. Just as the beauty of veins in stone is a trace of fracturing and mineralisation, the beauty of mountain folds is a trace of powerful processes. Here, the Matrix manifests itself not as decorative harmony, but as structural order arising through force.

The petal, by contrast, is frequently perceived primarily in aesthetic terms. Yet its beauty likewise possesses a morphological and functional basis. It is a plant organ, part of a reproductive system and a surface that interacts with insects, light and the environment. Comparing the petal and mountain fold therefore demonstrates that the beauty of form at different levels may result from

order rather than merely from external appearance. Beauty is an entry point into analysis, but not its conclusion.

An important methodological conclusion is the need for a two-level description. First, the form must be described: fold, layer, wave, edge, rhythm and surface. The mechanism must then be identified: biological growth or geological deformation. Beginning with the mechanism alone may obscure the morphological relationship. Discussing only the form may conflate different natures. Appropriate analysis therefore follows the sequence: visual observation—morphological description—differentiation of mechanisms—philosophical interpretation.

Applied to visual pairs, this means that each pair must be accompanied by an analytical commentary. For example: 'Both images display folded surfaces and undulating edges. In the image on the left, these result from the biological growth of the petal; in that on the right, they result from geological pressure, deformation and the erosional exposure of strata.' Such a commentary immediately prevents direct identification while preserving the purpose of the comparison.

Mountain folds may also be compared with the logic of the fern and leaf, but the petal is the more important comparison in this section. The leaf provides the axis and network, the fern self-similar branching, the succulent the layered rosette, and the petal a gently folded surface and active edge. The mountain fold is closest to the petal through its surface, undulation and the revelation of a layer. Petal logic is therefore a useful bridge between botanical and geological material.

In a broader sense, however, mountain relief may encompass all the botanical invariants: the axis of a valley resembles a central vein; lateral ravines resemble branching; folded slopes resemble petal surfaces; ranges form edges; layered exposures demonstrate levels; and drainage networks display natural self-similarity. These correspondences should be treated as a morphological grammar rather than an assertion of a single material code. The purpose of the chapter is precisely to demonstrate this grammar at the level of the Earth's surface.

The mountain fold also introduces an important theme: form as the result of compression. In botany, unfolding is frequently perceived as expansion. In geology, the fold reminds us that form may also arise from compression. Compression does not eliminate form, but transforms it. It creates curvature, stress, repetition, undulation and relief. In this sense, the mountain fold is a geological analogue of compressed potentiality, although not a biological one. It demonstrates that the Matrix includes not only expansion, but also compression.

Compression is particularly important for understanding mountains as bodies of time. Rock compression, uplift, folding and subsequent erosion may continue over immense periods. The result is a relief form perceived by human beings as landscape. That landscape, however, is the outcome of prolonged compression and destruction. A mountain fold is time compressed into a surface. A petal is the time of growth unfolded within thin tissue. Both forms are temporal, but time operates differently within them.

Petal logic also helps reveal not only the solidity, but also the fluidity of form within mountains. Mountain folds remind us that the Earth's crust, although solid, may undergo deformation. Visually, folded mountains sometimes resemble frozen waves. This impression is important, but must be translated into scientific language: the undulating form is a trace of the deformation of strata and subsequent relief formation. Geology thus reveals the slow fluidity of the solid.

In this respect, mountain folds are closely related to the stone waves considered previously. The difference is one of scale. A stone wave is visible on the surface of a small specimen. A mountain

fold is visible as part of a landscape. In both cases, the wave is not moving now, but records past movement, pressure or deformation. The transition from stone to mountain is therefore logical: small-scale lithomorphogenesis expands into large-scale geomorphogenesis.

Several illustrations may be proposed for this section. The first is a comparative pair: a close-up of flower petals and a folded mountain slope on which undulating surfaces and recurring curves are visible (*Fig. 4*). The second is mountain relief with clearly expressed folded strata, demonstrating the geological mechanism without a biological metaphor (*Fig. 5*). The third is a diagram of the morphological invariant of the fold: the petal and mountain fold as different manifestations of the curvature of a layer and an active edge (*Fig. 6*). Such a series would combine visual expressiveness with scientific precision.

The third illustration is particularly important. It may be constructed as a clear diagram: a petal on the left labelled 'surface', 'edge' and 'fold'; a mountain fold on the right labelled 'layer', 'curve', 'exposure' and 'edge of relief'; and the common invariant 'folded surface' in the centre. Such a diagram would immediately demonstrate that the comparison concerns not identity between objects, but structural relationships. This will be important to the study as a whole.

The captions should be of the following kind: 'Petal and mountain folding as different manifestations of the invariant of surface curvature'; 'Folded mountain relief: layer, pressure, exposure and active edge'; 'Morphological pair: the biological unfolding of a petal and the geological revelation of a folded stratum'. These formulations preserve philosophical depth without violating scientific boundaries.

Mountain folds and petal logic lead into the following section, in which the valley will be considered as an axis. Whereas the fold demonstrates the curvature of a surface, the valley demonstrates directed incision, a drainage line and the distribution of lateral forms. Together, the fold and valley provide two important structures of relief: the undulating surface and the axial line. One is connected with pressure and curvature, the other with flow and dissection. Both will be important to the geological level of the Matrix.

Thus, within the hypothesis of the Unified Matrix of the Universe, mountain folds may be regarded as large-scale geological forms in which layer, pressure, curvature, edge and exposure become a visible surface. Their comparison with flower petals helps to identify the morphological invariant of the folded surface, but must not result in the biologisation of geology. The petal and mountain fold belong to different mechanisms: growth and deformation, living tissue and rock, organic unfolding and geological exposure.

Petal logic is therefore a useful morphological instrument for interpreting folded mountain relief. It allows mountains to be perceived not only in terms of mass and elevation, but also as surface, layer, curvature, edge, rhythm and the revelation of concealed structure. Mountain folds demonstrate that the geological Matrix may manifest itself as the slow, large-scale and stress-laden unfolding of terrestrial form, in which pressure and time become visible within relief.

13.3. The Valley as an Axis

Whereas a mountain fold reveals the bending and deformation of the Earth's surface, a valley demonstrates another fundamental principle of relief: axial organisation. A valley is not merely a depression between areas of higher ground. In geomorphological and morphogenetic terms, it

acts as a line along which the Earth's surface opens, becomes dissected, directs water, redistributes matter and organises the surrounding forms. A valley constitutes an axis of relief because slopes, lateral ravines, tributaries, terraces, escarpments, ridges and pathways of material movement are organised around it.

In the botanical chapters, the axis was already considered one of the principal invariants of the Matrix. In a leaf, the axis is the midrib, from which the lateral veins extend and around which the leaf blade forms. In a fern, the main axis of the frond organises the lateral segments and repeated divisions. In a succulent, the centre of the rosette determines the radial and spiral arrangement of the leaves. In relief, the axis manifests itself differently. A valley is neither a living vein nor a plant organ. Nevertheless, it performs a morphologically similar function: it establishes direction, collects flows, separates and connects lateral forms, and organises the space around itself.

The valley as an axis arises through the interaction of structure, water, gravity and time. Water moves down the surface, following the gradient, zones of weakness, cracks, faults, lithological differences and pre-existing depressions. Gradually, the drainage line deepens and widens, receives tributaries, and forms slopes and a valley floor. In this way, an initial direction develops into a spatial form. A valley is a line that has become a landscape.

This transformation of a line into a landscape is particularly important for the hypothesis of the Matrix. At the botanical level, the midrib of a leaf transforms a line into a plane: lateral branches diverge from it, a network forms, and a surface subsequently emerges. At the geological level, a valley transforms a drainage line into a dissected space: lateral ravines and tributaries branch off from the main channel, while slopes, terraces, drainage divides, screes and erosional forms develop. In both cases, the axis does not remain a single line; it creates a system.

The difference between the underlying mechanisms must, however, be clearly maintained. A leaf vein distributes water and nutrients within living tissue. A valley collects and directs surface or subsurface runoff, erodes rock, transports sediment and shapes relief. A leaf-vein network develops within an organism, whereas a valley network forms through erosion and drainage. The similarity between a leaf vein and a valley is therefore morphological rather than biological. What they share is the relationship 'main axis — lateral branches — surface — edge', but the nature of these relationships differs.

A valley is one of the most powerful axial structures of relief because it simultaneously separates and connects. It divides a mountain mass into slopes, valley sides, ridges and drainage divides. At the same time, it connects the headwaters, middle and lower reaches; links lateral tributaries; collects water and detrital material; and directs them towards lower levels. A valley is therefore not an empty space, but an active channel of organisation. It creates order within mountainous space.

Visually, a valley is often perceived as a negative form: as a cut, depression or absence of mass. Morphogenetically, however, this is misleading. A valley is a positive structure of process. It exists through the action of water, gravity, erosion, weathering, glacial movement, tectonic lines and rock resistance. A depression in the relief does not imply passivity. On the contrary, a valley is often one of the most active zones in a landscape. Movement, transport, erosion, accumulation and the exposure of geological structure are concentrated within it.

The valley as an axis reveals particularly clearly the connection between relief and flow. A flow of water creates a direction. The direction creates a line. The line deepens and becomes a channel. The channel forms the valley floor. The slopes respond to the deepening of the valley through

scree formation, landslides, erosional grooves and lateral tributaries. Thus, a single line of movement gradually organises an entire complex of relief forms. The valley is the spatial trace of a directed flow.

In this sense, the valley may be described as an axis of material redistribution. Material from mountain slopes moves down into the channel, is transported by water, and is deposited on terraces, alluvial fans, floodplains, deltas or in lower basins. A valley does not merely cut through the surface; it moves matter. It converts the solid into the mobile, the higher into the lower, slope material into channel material, and the local into the transported. The valley is therefore not only a form, but also a processual channel.

Within the model of the Matrix, this broadens the concept of the axis. An axis is not always a fixed line of symmetry. It may be a line of flow, erosion, collection or exposure. A valley is not absolutely symmetrical: its sides may differ, its channel may meander, and its tributaries may be distributed unevenly. Yet it still organises space. In geology, therefore, an axis should be understood not as an ideal geometric straight line, but as a functional direction around which a structure forms.

A valley is also a line of incision. Water, ice or another agent of relief formation may deepen the surface, creating a section through it. In this sense, a valley resembles a natural cross-section of terrestrial form. It exposes strata, folds, cracks, lithological boundaries and slope structures. Where a valley is deep, it can reveal the internal geology of a mountain mass. The valley as an axis is therefore not merely a direction of drainage, but also a line along which hidden structure is exposed.

This is particularly important in relation to the preceding chapter on stone. A section through a stone makes its internal structure visible. A valley makes the internal structure of the Earth's surface visible. In both cases, revelation is associated with cutting. A section through stone may be produced by human action or by natural fracture, whereas a valley is created by natural processes. Morphologically, however, both cases demonstrate the same principle: hidden structure becomes visible along a line of opening.

A valley also frequently inherits zones of weakness. A river may follow a fault, a fractured zone, a boundary between rock types, a softer stratum or a pre-existing depression. In such cases, the valley does not merely create an axis; it makes use of an axis already prepared by the internal structure. The surface flow selects a path determined by an underlying difference. This demonstrates a crucial principle of relief: external form is often organised by internal heterogeneity. A valley may be the surface expression of a hidden geological line.

In this sense, the valley is the meeting place of two axes: an internal structural axis and an external hydrological axis. The internal axis may be a fault, the orientation of strata or a zone of weakness in the rock. The external axis is the drainage line. When the two coincide, the valley becomes particularly stable and pronounced. When they conflict, the relief may become more complex: the channel cuts across structures, forms gorges, changes direction and creates asymmetrical slopes. A valley must therefore always be analysed in terms not only of its surface, but also of its geological foundation.

The valley as an axis also creates lateral forms. Lateral valleys, tributaries, ravines, hollows and erosional grooves extend from the main valley. In plan view, such a system may resemble a branching structure. The main valley collects smaller drainage lines, just as a trunk gathers branches or the midrib of a leaf connects with its lateral veins. It must be stressed once again,

however, that this is not biological branching, but hydrological and erosional branching. What they share is the morphological principle of a hierarchical network.

This hierarchy is particularly important for the fractal analysis of relief. A principal river has tributaries; those tributaries have smaller tributaries; and these, in turn, have still smaller streams and ephemeral watercourses. In mountainous relief, this network may create a complex system of valleys and ravines. At different scales, the relationship ‘main line — lateral branch — minor drainage line’ is repeated. This is not strict mathematical fractality in an infinite sense, but a natural hierarchy of scales. It has limits and depends on climate, rock type, gradient, time, vegetation and hydrological regime.

The valley network is therefore one of the clearest geological examples of natural self-similarity. It shows how a flow line can organise a surface according to a hierarchy of nested scales. A major valley contains lateral valleys; lateral valleys contain ravines; and ravines contain smaller grooves. The entire system can be read as a distributed network of relief. This makes the valley an important bridge between leaf venation, the hierarchy of a fern and geomorphological structure.

Yet a valley not only collects lateral forms; it also creates edges. Valley sides, break-of-slope lines, terrace scarps, channel banks and the edges of ravines are all active boundaries. The valley has an internal periphery: it is bounded by slopes and drainage divides. These edges are continuously reworked. Slopes shed material, banks are undercut, terraces are eroded and ravines widen. The valley as an axis is therefore inseparable from the active edge. Axis and edge form a single system: the channel deepens the axis, while the slopes respond by modifying their edges.

Valleys may assume different morphological types. V-shaped valleys are generally associated with active fluvial incision, in which the flow deepens the channel while the slopes form through weathering and gravitational removal. U-shaped valleys are often associated with glacial modification, in which a glacier widens and abrades the profile. Canyons demonstrate deep incision into resistant rocks. Broad valleys may reflect prolonged erosion, accumulation, tectonic conditions or changing climatic phases. Every valley form results from its own particular combination of processes.

This diversity shows that the valley as an axis has no single universal outward appearance. An axis may be narrow and deep, broad and gently contoured, sinuous, straight, glacial, fluvial, tectonic, erosional, dry or ephemeral. In every case, however, the valley organises space directionally. It creates a longitudinal structure along which the movement of water and matter can be read. The axial invariant is therefore preserved amid considerable morphological diversity.

A valley also has longitudinal and transverse profiles. The longitudinal profile shows the change in elevation along its axis, from the headwaters to the lower reaches. The transverse profile reveals its cross-sectional form: slopes, floor, channel, terraces and scarps. Together, these two profiles provide a three-dimensional understanding of the valley. The longitudinal axis expresses the direction of the process; the transverse profile expresses the opening of the surface around the axis. This is important within the model of the Matrix: an axis does not exist without a surrounding form. It always generates or organises a field around itself.

If a valley is compared with a leaf, one might say that the leaf’s midrib has lateral veins and a blade, while the valley has lateral tributaries, slopes and drainage divides. The leaf blade, however, is created through the growth of tissue, whereas the valley’s slope system is created by erosion, gravity and the resistance of rocks. The valley is therefore a geological analogue of axial

organisation, not a biological structure. It demonstrates that the principle ‘axis — lateral forms — surface — edge’ can operate in another material and on another timescale.

The valley may also be related to the concept of the centre, although this centre is linear rather than point-like. In a flower, the centre is the region around which the petals are arranged. In a succulent, the centre is the growth point of the rosette. In a leaf, the centre becomes the midrib. In relief, the valley becomes the linear centre of a local landscape. Settlements, routes, vegetation, the water regime, slopes and lateral forms are organised around it. Geomorphologically, it is the central line of depression and drainage.

Such a linear centre is particularly important for the hypothesis of the Matrix because it demonstrates that a centre is not always situated in the middle of a form as a point. It may be an axis, a channel, a line of weakness or a direction of movement. In relief, the centre is often distributed along a valley. This broadens the concept of centredness. The Matrix may be point-centred, as in a flower; radially centred, as in a succulent; axially centred, as in a leaf; or linearly centred, as in a valley.

A valley is also a zone of accumulation. Although it is often formed through erosion and incision, sediment, alluvium, detrital material, soils and organic matter may accumulate on its floor. In the upper parts of a valley, erosion and transport predominate; in its lower parts, transport and accumulation; and on plains, frequently accumulation itself. A valley therefore combines destruction and creation. It cuts through mountains, yet creates new surfaces: floodplains, terraces, alluvial fans and alluvial plains. This is another example of geological morphogenesis encompassing both destruction and form generation.

In this respect, the valley is a processual axis within the cycle of matter. Material eroded from slopes enters the channel, is transported, sorted and deposited, and may subsequently become part of new sedimentary structures. The valley connects mountain relief with future sedimentation. It constitutes a transition between the destruction of stage D and a new stage A in the geological cycle. In this sense, the valley links Chapter 13 with the preceding section on the transition from D to a new A.

A valley is also related to time. A young valley may be narrow, steep and actively incising. A more mature valley may have a widened floor, terraces and a developed tributary network. An ancient valley may be partly filled with sediment, reshaped, inherited by a modern channel or even left dry. A valley is therefore not merely a form, but a stage in the history of relief. Its profile, width, depth, terraces, channel and lateral forms may indicate successive stages of development.

Understanding the valley as a temporal axis is important for the Matrix. A valley not only directs space, but also contains a sequence of time. Its upper sections, terraces, abandoned channels, modern incisions, alluvial fans, rockfalls and screes may all belong to different phases. A valley is a multitemporal axial structure. It demonstrates how geological time is distributed along a line.

A valley may also be a site of accelerated morphogenesis. Processes on its slopes and within its channel often occur more rapidly than on stable drainage divides. The flow concentrates energy, undercuts banks, transports material and activates ravines. The valley is therefore a zone of heightened morphogenetic activity. It concentrates change. A ridge may preserve its form for a relatively long time, whereas a valley may continually reorganise its channel, slopes and floor.

At the same time, a valley may also be a zone of stabilisation. A floodplain, soil, vegetation and a sedimentary surface may form on its floor. Terraces may preserve former channel levels. Lakes within valleys may accumulate sediment. Human settlements often arise in valleys because of

their water, soil and relatively accessible space. A valley thus combines activity and stability: its channel changes, but the valley axis may persist for a very long time.

In mountainous relief, the valley is often contrasted with the ridge. A ridge is a positive form, a line of elevation and a drainage divide. A valley is a negative form, a line of depression and drainage. Morphogenetically, however, the two are interconnected. A ridge cannot exist without slopes; slopes lead to valleys; valleys dissect ridges; and drainage divides separate catchments. Ridge and valley form a pair. One organises the upper boundary, the other the lower axis. Together, they create the structure of relief.

This pair may be compared with the botanical relationship between vein and edge. The midrib organises the leaf internally, while the edge completes its surface. In relief, the valley organises depression and drainage, while the ridge or crest organises the drainage divide and the edge of the elevation. Once again, however, this analogy is morphological. It shows that forms are frequently constructed through polar structures: axis and edge, depression and elevation, flow and divide, centre and periphery.

The valley is also an important element in the analysis of directionality. In a leaf, direction runs from the base towards the apex. In a fern, it runs along the frond. In a succulent, it runs from the centre towards the periphery. In a valley, direction runs from the headwaters towards the lower reaches, from the source towards the basin, and from higher to lower ground. This direction is determined by gravity and gradient. The valley is therefore one of the clearest expressions of a geological vector. Within it, direction is not abstract, but connected with the movement of water and material.

In this sense, the valley is a form in which gravity becomes a line. Water flows downwards, debris moves downwards, and slope processes are directed downwards. The valley collects these movements. Its axis is a line of gravitational order. It demonstrates how the vertical energy of elevation is converted into the horizontal and inclined movement of flow. The valley is therefore not merely a geometric depression, but an energetic structure of relief.

A valley may also record climatic history. A humid climate intensifies fluvial erosion and the development of a drainage network. Glacial periods may create U-shaped valleys, moraines, glacial troughs and hanging valleys. An arid climate may preserve sharp forms or create ephemeral channels. Climatic change may leave terraces, abandoned channels and altered profiles. The valley as an axis of relief may therefore also serve as an axis of climatic memory. It preserves not only tectonic and hydrological traces, but climatic ones as well.

A valley may also be tectonically controlled. Some valleys follow faults, grabens, zones of subsidence or lines of weakness. In such cases, their axis has a deep-seated origin. It is not only excavated by water, but also determined by the structure of the Earth's crust. This makes the valley particularly important for the Matrix: its axis may be simultaneously surficial, hydrological and deep-seated. The visible form becomes an expression of an invisible organisation.

Valleys in which the channel changes direction sharply are particularly striking. Such bends may be associated with tectonic lines, variations in rock resistance, river capture, obstacles, glacial forms or other factors. They demonstrate that the valley axis is not a freely drawn line, but forms in dialogue with material and structure. The axis may curve, branch, break, inherit older forms and undergo reorganisation. The valley is therefore a dynamic axis.

The dynamic nature of the valley is particularly apparent in river meanders on lowland sections. In the mountains, a valley often appears rigid, incised and confined by slopes. On plains, the river

may bend more freely, forming meanders, oxbow lakes and floodplains. Here the axis becomes mobile. It does not merely cut through the surface, but migrates within the valley space. This demonstrates that an axis may be not a fixed line, but a zone of possible lines. The valley contains the channel, but the channel may change its position.

Although the principal emphasis in this chapter remains on mountain valleys and ridges, it is important to remember that the valley as an axis has several modes. A mountain valley is more commonly associated with deep incision, gradient and rigid structure. A lowland valley is more commonly associated with meandering, floodplains and accumulation. A glacial valley has a different profile. A tectonic valley may be associated with the subsidence of a block. This variability demonstrates that a single invariant—the axis—may manifest itself in different morphological types.

Within the A–B–C–D model, the valley may be described as follows. Stage A is an initial surface or zone of weakness in which developed incision is not yet present. Stage B is the emergence of a primary drainage line, crack, fault-controlled depression or incipient channel. Stage C is the development of the valley system: deepening, widening, tributaries, slopes, terraces, screes, ravines and lateral forms. Stage D is a stabilised or mature valley structure that can be read as an axis of relief. A new A emerges through sedimentation, infilling, material transport and the incorporation of this material into new geological processes.

This scheme is, once again, conditional. A valley does not develop like an organism. It nevertheless passes through stages of geomorphological formation. A primary line becomes a system. A simple depression becomes a landscape. A channel becomes a valley, a valley becomes a network, and a network becomes part of a catchment. The A–B–C–D model therefore helps to describe the valley as a processual axis rather than a static feature on a map.

The valley may also be considered as a catchment structure. Every valley belongs to a drainage basin. The main valley collects lateral lines, while the entire system directs water towards a common outlet. This makes the valley part of a larger organisation. If a leaf vein belongs to a leaf, then a valley belongs to a basin. The basin is the whole; the valley is its axis; the tributaries are its lateral branches; and the drainage divides are its edges. This morphological scheme is particularly close to the Matrix: centre or axis, network, edge, surface and flow.

The drainage divides in this system act as external boundaries. They separate one basin from another. In a leaf, the edge separates the leaf surface from the external environment. In a basin, the drainage divide separates one drainage system from another. The mechanisms are not the same, but a common logic of the boundary is present. The valley as an axis is always connected with the boundaries of its catchment. Without a drainage divide, the valley would have no defined collection area. Axis and boundary therefore define one another.

The valley may also serve as an axis of human occupation of the landscape. Although this chapter is primarily concerned with natural morphogenesis, it should be noted that valleys frequently become routes of travel and sites of settlement, agriculture, roads and cultural connections. This is because a valley concentrates water, relatively convenient routes, fertile sediments and sheltered spaces. When the discussion turns to the cultural level, this axial role of the valley may acquire additional significance. Here, however, the natural level must be maintained: first and foremost, the valley is a geomorphological axis.

The valley as an axis also helps us understand the relationship between visible and invisible flow. Even a dry valley may preserve the form of a former drainage system. Ephemeral watercourses

may operate only during particular seasons or following heavy precipitation, yet their lines remain in the relief. A glacial valley may retain its form after the glacier has disappeared. An ancient river valley may be partly filled with sediment, but its axis continues to exist. A valley may therefore preserve the trace of a flow that is no longer present. It is an axis of the memory of movement.

This brings the valley closer to the stone wave. A stone wave reveals movement stabilised within a structure. A valley reveals flow stabilised within relief. In both cases, the process may have changed or ceased, yet the form preserves its direction. The valley is therefore both an active and an archival form. It preserves the trajectory of water, ice, erosion, transport, pressure or a tectonic line.

A valley also demonstrates the relationship between depth and revelation. The deeper the valley, the more fully it exposes the internal strata and structure of the mountain mass. Gorges and canyons are particularly striking in this respect. They reveal vertical walls, layering, faults, differences between rocks and traces of former levels. Such a valley becomes a geological section created by nature. It enables the Earth to be seen in depth. A deep valley is therefore an axis not only of drainage, but also of knowledge of structure.

In this sense, the valley has epistemological significance: it makes the hidden accessible to observation. A geologist can read outcrops, strata, folds and faults within a valley. A morphologist can observe the relationship between line and surface. A philosopher of form can consider the valley as an example of how a process creates an axis and how the axis reveals structure. Within the hypothesis of the Matrix, the valley becomes one of the key objects for understanding the geological unfolding of form.

The valley as an axis also prepares the way for the following section on the serrated edges of relief. If the valley is a line of depression and drainage, mountain edges, crests, scarps and faults constitute active peripheries that bound and complicate this axial system. The valley axis and the ridge edge operate together. The valley incises; the edge erodes. The valley collects; the edge divides. The valley directs movement downwards; the ridge forms a drainage divide. Analysis of the valley must therefore be followed by analysis of the edge.

The illustrations for this section should present the valley specifically as an axial structure. The first image might show a mountain valley from above or in perspective, clearly revealing the main axis, slopes and lateral branches (*Fig. 7*). The second might provide a comparative diagram of ‘leaf vein — valley in relief’, emphasising the morphological similarity of axial organisation despite the difference in mechanisms (*Fig. 8*). The third might show a fluvial or erosional network as a natural hierarchy of a main valley and lateral tributaries (*Fig. 9*). Such images would help connect the geological level with the botanical invariants examined earlier.

A diagram showing the valley not merely as a line, but as a system, would be particularly important. The main channel or valley axis would occupy the centre. Tributaries, ravines, slopes and drainage divides would be shown on either side. Arrows could indicate the direction of water and material transport. The valley sides could be marked separately as active edges. Such a diagram would make it clear that a valley is not an empty space between mountains, but an organising structure of relief.

Thus, within the hypothesis of the Unified Matrix of the Universe, the valley may be considered an axial structure of geological morphogenesis. It arises through water, gravity, erosion, tectonic predisposition, the resistance of rocks and the duration of time. It organises slopes, tributaries,

edges, terraces, screes and channel forms. It collects matter, exposes internal structure, directs movement and records the history of flow. The valley is a line that has become space.

A valley is not a passive depression in the relief, but an active axis of terrestrial form. It demonstrates how the geological Matrix may manifest itself through direction, incision, drainage, lateral branching, the distribution of matter and the exposure of hidden structures. If the mountain fold demonstrates the bending of a surface, the valley demonstrates the axial organisation of relief. Together, they enable the Earth's surface to be read as a complex system of slow morphogenesis, in which line, edge, flow and layer become visible geological form.

13.4. Serrated Edges of Relief

Having considered the valley as an axis of relief, it is necessary to turn to another key category of terrestrial form: the edge. In geological and geomorphological terms, the edge is no less important than the axis. The valley determines the direction of drainage, incision and the distribution of lateral forms; the edge reveals a limit, rupture, scarp, crest, line of resistance, zone of erosion and active interaction between the surface and its environment. If the valley organises relief internally as an axial line, the edge organises it externally as the boundary of form.

Serrated edges of relief are particularly striking in mountainous regions. Sharp crests, rocky arêtes, peaks, scarps, cliff lines, fractured summits, jagged drainage divides, dissected slopes and eroded plateau margins create the impression of an uneven, active and tension-filled periphery of terrestrial form. Such a periphery is not an accidental external contour. It arises from the interaction of tectonics, rock composition, fracturing, weathering, erosion, glacial modification, gravitational collapse and prolonged degradation. The serrated edge of relief is therefore a morphological record of process.

The significance of the edge of a leaf or petal has already been considered in the botanical chapters. A leaf edge may be smooth, serrated, undulating, lobed or dissected. It reveals an active periphery of growth, environmental interaction, tissue distribution and internal venation. A petal edge may be soft, undulating, irregular, thin, coloured, and both functionally and visually expressive. In a succulent, the edge of a leaf module may be dense, protective, coloured or thickened. At the geological level, the edge is likewise active, but its nature differs: it is not a zone of living growth, but a zone of erosion, exposure, resistance and the reworking of the Earth's surface.

For this reason, any comparison between the serrated edge of relief and the edge of a leaf or petal must be made with care. A mountain crest is not a leaf, and a rocky scarp is not a petal. At the level of morphological logic, however, a common invariant can be discerned: the edge is the zone in which a form interacts most actively with its external environment. For a leaf, this environment comprises air, light, moisture and biological exchange. For mountain relief, it comprises the atmosphere, water, ice, temperature, gravity and mechanical erosion. In both cases, the edge indicates not the final completion of form, but its openness.

The serrated character of relief demonstrates particularly clearly that an edge is not a simple line. It has a structure. It may be dissected, rhythmic, discontinuous, sharp, smoothed, stepped, broken, undulating or angular. In mountain ridges, serration often develops where rocks offer different degrees of resistance to erosion, where cracks create lines of weakness, where glaciers

and frost weathering carve crests, where rockfalls remove part of the material, and where more resistant areas remain as peaks and arêtes. The serrated edge of relief is therefore not a decorative irregularity, but the result of form being selected by time.

This selection is especially important for the geological Matrix. The material of relief is heterogeneous. Some rocks are more resistant, others weaker. Some areas are more intensely fractured, while others are more monolithic. Some surfaces are exposed to wind, ice and water, while others are protected. Consequently, the edge does not erode uniformly. It becomes serrated precisely because erosion acts selectively. Serration is the visible trace of differences in resistance. Where matter resists more strongly, a projection remains; where resistance is weaker, a depression, notch, rupture, couloir or crack develops.

In this sense, the serrated edge of relief is a form of differentiated erosion. Here, erosion does not destroy relief completely; instead, it produces a more complex contour. A smooth line becomes serrated; a massive surface becomes a system of projections and depressions; a crest becomes an alternation of peaks and saddles. This demonstrates once again that destruction can be form-generating in geological morphogenesis. An edge may arise not only through growth or construction, but also through the removal of matter.

Such a process can be compared with the edge of a leaf only at the level of a general morphological idea. A serrated leaf edge develops within living tissue in association with growth, venation, the regulation of form and biological organisation. A serrated mountain edge develops through faults, weathering, erosion, glacial modification and gravitational processes. What they share is not a mechanism, but the fact that the edge becomes the zone in which form is most clearly expressed. It is at the edge that rhythm, asymmetry, local differences, contact with external forces and the history of formation become visible.

The mountain crest is one of the principal types of active edge. It separates one slope from another, one drainage basin from another and one side of the relief from the other. A crest may be sharp or smoothed, straight or sinuous, continuous or broken, serrated or gently contoured. Its form depends on rock type, climate, elevation, glacial history, fracturing and the duration of erosion. A crest is not merely a line at the top of a mountain. It is a drainage divide, a boundary between flows, a line of resistance and a zone of intensive environmental action.

The serrated crest is particularly important because it reveals the conflict between elevation and erosion. Tectonics or structural resistance creates an elevation, while external forces begin to dismantle it. Peaks remain as zones of greater resistance, while saddles and notches develop in zones of weakness or intensified erosion. As a result, the crest line becomes rhythmic. It resembles the serrated edge of a leaf or the dissected edge of a petal, but results from an entirely different history. It is a rhythm of geological resistance.

Rock scarps are also active edges of relief. A scarp marks an abrupt transition between levels of the surface. It may be associated with a fault, differences in rock resistance, erosional incision, coastal erosion, glacial modification or the exposure of a stratum. A scarp is an edge at which the surface appears to break off. Its vertical or steep face reveals the internal structure: strata, cracks, rocks and zones of disintegration. A scarp is therefore simultaneously an edge of form and a section through form.

In this respect, a rock scarp resembles the edge of a fracture in a stone. In an individual stone, a fracture exposes the internal structure. In relief, a scarp exposes the structure of a mountain mass. The scales, however, are different. A fractured stone can be held and examined in the hand;

a mountain scarp may take the form of a wall, canyon, cliff or rocky valley side. In both cases, the edge becomes a site where the interior is revealed. A geomorphological scarp, however, is created by natural processes and forms part of the dynamics of the landscape.

A fault edge is even more tension-filled in character. If a scarp is associated with faulting or the displacement of blocks, it records a disruption of the integrity of the Earth's crust. Such an edge may be straight, abrupt and extensive. It shows that the form arose through rupture and displacement. In biological form, an edge is generally associated with the growth and differentiation of an organ. In fault-controlled relief, the edge is associated with tectonic disruption. It is an edge not of gentle opening, but of rupture. Nevertheless, it too is an active periphery of structure: erosion may proceed along it, a valley may form there, and slope processes may develop.

The serration of relief is frequently intensified by fracturing. Rocks cut by cracks do not erode as a homogeneous mass, but along lines of weakness. Water enters the cracks, freezes, expands and breaks down the rock. Plant roots may increase the widening of cracks. Water and wind remove fine material. Rockfalls detach blocks. As a result, the edge becomes broken, angular and serrated. A crack that was initially an internal line becomes part of the external contour of the relief.

This is a highly significant lithomorphogenetic transition: an internal boundary becomes an external edge. In a stone, a crack may become a vein or a line of fracture. In relief, a crack may become a couloir, scarp, cliff, scree line, the beginning of a ravine or part of a serrated crest. Internal structure thereby governs external form. The edge of relief is therefore often the result of hidden lines brought to the surface through erosion.

The serrated edge of relief is also associated with glacial processes. In high mountain regions, glaciers may carve sharp crests, corries, cirques, pyramidal peaks, glacial troughs and steep valley sides. Frost weathering and glacial erosion combine to create sharply dissected edges. Such edges appear particularly serrated because ice and cold intensify erosion along cracks and zones of weakness. Here the edge becomes the result of processes within the cryosphere—ice, snow, freezing and thawing.

Water also forms edges. Fluvial erosion undercuts banks and creates cliffs, scarps, canyons and terraces. Wave action along coasts creates cliffs and abrasion scarps. Ephemeral flows dissect slopes with ravines, producing a serrated network of edges. Water not only flows along the axis of a valley, but also shapes its edges. Valley sides, terrace scarps, channel banks and ravine walls are water-erosional edges. Axis and edge are therefore once again interconnected.

Gravity makes an edge particularly unstable. Rocky cliffs, steep slopes, cornices and eroded crests are all zones from which material may fall, slide or collapse. The edge exists in a state of tension between preservation and failure. The steeper the edge, the more strongly gravitational instability manifests itself. A mountain edge is therefore not merely a geometric line, but a zone of risk, movement and the potential downward transfer of matter. In this sense, the edge of relief is always potentially processual.

In botany, the edge of a leaf may also be a zone of activity, but this activity is associated with growth, exchange and tissue formation. In geology, edge activity is often associated with erosion and transport. This distinction is fundamental. Nevertheless, the general category of the active periphery remains valid. The edge is the place where form encounters external forces. For this very reason, the edge is often the most informative part of a structure. From an edge, one may

infer the growth of a leaf, the deformation of a petal, the erosion of a mountain, the direction of erosion and the resistance of the material.

Serrated edges of relief also reveal asymmetry. One slope of a ridge may be steeper and the other gentler. One side of a valley may undergo more active erosion, while the other is more stable. One scarp may be fresh and sharp, another smoothed. One edge of a plateau may be dissected by ravines, while another retains an even line. This asymmetry records differing conditions: wind direction, slope orientation, solar radiation, moisture, rock resistance, glacial action and tectonic inclination. The edge records not only form, but also environmental inequality.

The asymmetry of the edge is particularly important for the Matrix because it demonstrates that a universal invariant does not imply perfect symmetry. An active edge may be uneven, disrupted, damaged or broken. Yet it is precisely through this irregularity that the process is revealed. A smooth edge may be less informative than a serrated one. Serration reveals a history of interactions. It indicates that the form encountered different forces, resisted, eroded, endured and changed.

Serrated edges of relief also possess a hierarchy of scales. At a large scale, the line of a mountain ridge may be serrated. At an intermediate scale, it may be the edge of a rock scarp. At a small scale, it may be the fractured edge of an individual block, scree fragment, stone or fracture surface. At a still smaller scale, it may be the roughness of the rock surface. The edge may thus reproduce complexity at different levels. This is not always strict fractality, but it is structural heterogeneity across scales. An edge in the relief is rarely a simple line; it is a system of edges.

This hierarchy of edges connects mountain relief with the preceding chapter on stone. A stone has an external edge, internal edges of layers, edges of cracks and edges of veins. Relief has crests, scarps, valley sides, terrace margins, fault lines, banks and ravines. In both cases, the edge is not a single contour, but a system of boundaries. The Matrix manifests itself not only in the centre and axis, but also in the multiplicity of boundaries through which form becomes legible.

The serrated edge of relief is also connected with the concept of a residual form. Many peaks, crests and rocky projections are remnants of more extensive structures that have been eroded over time. What remains becomes the edge. In such cases, relief reveals not only formation, but disappearance. A serrated line may be the remnant left after material has been removed. This is an important geomorphological principle: a form may be created by what has escaped erosion. The edge of relief is frequently the boundary of what has been preserved.

In this sense, the serrated edge is a negative-positive form. It is positive as a visible projection, yet it arose through the negative process of removing the surrounding material. A peak exists because neighbouring material was eroded more intensively. A scarp exists because the lower surface was cut away or displaced downwards. A cliff exists because the slope lost stability. Relief therefore teaches us to see form not only as addition, but also as subtraction. The serrated edge is the result of geological subtraction.

This logic is particularly important when relief is compared with petals and leaves. A serrated plant edge is generally formed through differentiated tissue growth. A serrated mountain edge is frequently formed through differentiated erosion of matter. In both cases, a serrated contour emerges, but in one it is the trace of construction and in the other the trace of destruction. Morphological similarity may therefore conceal opposing processes. This is precisely why visual pairs require rigorous commentary.

Serration in relief may also be related to the orientation of strata. If more and less resistant strata reach the surface at an angle, erosion may create stepped forms, ridges, cuestas and scarps. In such cases, the edge expresses internal layering. The surface of the relief appears to cut across the strata, while their differing resistance creates a serrated or stepped line. Here, once again, the edge is the place where internal structure emerges at the surface.

In fold mountains, a serrated edge may emphasise the form of a fold. Exposed strata may form repeated ribs, ridges and undulating scarps. If a fold has been cut by erosion, its edges become part of the relief. Serration then constitutes not only the result of erosion, but also a means of seeing deformation. The edge shows how a stratum was bent, where it was exposed, where it was eroded and where it survived. A serrated edge may therefore serve as a geological indicator of structure.

Faults also create edges of a distinctive type. A fault scarp may be abrupt, straight and extensive. It may form the boundary of a block, the side of a depression, the line of a valley or the edge of a mountain front. Such an edge is tectonic in origin and may subsequently be reworked by erosion. The fault edge is particularly important for the Matrix as an example of a boundary arising through a disruption of integrity. Not every boundary is a gentle transition. Sometimes a boundary is a rupture.

This idea is connected with a broader philosophy of form. Form requires a boundary, but boundaries may differ. A boundary may be soft, like the edge of a petal; functional, like the edge of a leaf; protective, like the edge of a succulent leaf; destructive, like the edge of a fracture; tectonic, like a fault scarp; or erosional, like the side of a valley. The universal invariant of the edge does not have a single meaning. It manifests itself through different modes: growth, protection, exchange, exposure, destruction, rupture and resistance.

The serrated edge of relief also enables us to examine the relationship between order and chaos. At first sight, an eroded mountain edge may appear chaotic. Closer analysis, however, may reveal regularities: the orientation of cracks, the repetition of scarps, their relationship to the direction of strata, the rhythm of peaks, their correspondence with drainage divides, and the lines of glacial modification. An edge may be irregular without being arbitrary. Its complexity is the result of processes. A chaotic outward appearance therefore does not preclude morphogenetic structure.

This proposition is important for the entire hypothesis of the Matrix. The Matrix should not be understood exclusively in terms of symmetry and ideal regularity. It may also manifest itself in a complex, irregular and eroded edge. What matters is the presence of a structural logic: a relationship with material, force, direction, time and environment. The serrated mountain edge is precisely such a form: it is not ideal, but it is organised by the history of its processes.

The edge of relief is also a zone of transition between scales. Atmospheric processes, slope processes, catchments, vegetation, snow regimes and rock fracturing converge along a ridge line. Small processes at the edge may have large consequences: a crack widens, a block falls, a scree slope grows, a channel receives material, and a valley changes form. The edge is a sensitive zone within the system. A small change at the edge may affect a much larger form. This makes the edge morphogenetically significant.

In this sense, the serrated edge of relief is not only a result, but also a source of further processes. An eroded crest produces detrital material. A cliff produces scree. Scree affects the slope. Slope material enters the valley. The valley transports it onwards. The edge thereby enters the cycle of matter. It does not merely complete a form, but initiates a new phase. This is particularly

important for the transition from D to a new A: the erosion of an edge may become the beginning of a new sedimentary process.

Serrated edges of relief may also be related to climate. In cold, high-mountain conditions, an edge may be sharp as a result of frost weathering and glacial erosion. In a humid climate, an edge may be strongly dissected by water erosion. In an arid climate, abrupt cliffs and rocky forms may persist, although scree-covered slopes may also develop. In the tropics, chemical weathering may smooth or rework edges in a different manner. The serration of relief is therefore not only a structural, but also a climatic indicator.

An edge may also serve as a temporal indicator. A young fault scarp may be sharp. An old scarp may be smoothed. A young ravine has steep sides, while an older one has gentler slopes. A recent rockfall produces a sharp edge; an ancient scree deposit, a more stabilised form. The shape of an edge may therefore indicate the stage of a process. Sharpness, smoothness, degree of dissection, vegetation cover and the presence of scree are all signs of the temporal state of the relief.

Within the A–B–C–D model, the edge may be described as a structure developing through stages. At stage A, the surface is still relatively intact. At stage B, an initial rupture, scarp, crack, line of weakness or beginning of dissection appears. At stage C, the edge becomes more complex: serrations, screes, lateral incisions, cracks, niches, scarps and rockfalls emerge. At stage D, a stabilised or temporarily stable line of relief is formed—a crest, valley side, rock edge or fault scarp. Subsequent erosion of this edge may create a new A in the form of detrital material or sediment. The edge thus participates in the geological cycle.

It is particularly noteworthy that different parts of an edge may simultaneously occupy different stages. One section of a crest may have been freshly eroded, another stabilised, a third may be actively shedding debris, and a fourth may be covered with vegetation. The edge of relief does not therefore always possess a single stage. It is a mosaic of processes. This distinguishes the geological level from the more orderly biological model. In relief, different parts of the same form may exist within different temporal regimes of geomorphogenesis.

The serrated edge also plays an important role in the perception of mountains. It is often the ridge line that defines the silhouette of a mountain system. The observer sees the horizon line, peaks, saddles and crests. This line acquires considerable symbolic power, yet its morphological meaning extends beyond aesthetics. The silhouette of the mountains results from the interaction of internal structure and external erosion. It shows where terrestrial form resisted, where it yielded, where it was cut and where it survived. The mountain silhouette can therefore be read as a morphogenetic line.

A visual comparison between a serrated mountain edge and a serrated leaf edge may be highly expressive. It requires a precise caption, however—for example: ‘The serrated edge of a leaf and a serrated mountain crest as different manifestations of the active periphery: biological growth and geological erosion.’ Such a caption immediately identifies both the similarity and the difference. The book must not only present an analogy, but also teach the reader how to interpret it correctly.

The serrated edge of a petal or leaf may be regarded as a biological periphery, and serrated mountain relief as a geomorphological periphery. In both cases, the edge is where the whole becomes most variable. The centre of a form may be more stable, while the edge is more sensitive

to external conditions. This is a common principle of many systems. The edge opens the form to the world, and for this very reason it is the first part to experience the world's effects.

A mountain edge may also be a zone of exposure. It is exposed to wind, sunlight, snow, frost and precipitation. A sun-facing slope erodes and is colonised by vegetation differently from a shaded slope. The windward side receives more precipitation, the leeward side less. Snow cornices, avalanches, glaciers and wind erosion all affect edges differently. The edge of relief is therefore a zone of differentiated external action. Its form preserves the trace of its position in space.

The edge of relief is also connected with the concept of a stability threshold. A slope has an angle beyond which its material becomes unstable. A cornice may collapse. A scarp may retreat. A crest may erode from both sides. The edge therefore reveals a boundary of stability not only geometrically, but physically. It is the place where the system balances between preserving its form and losing it. In this sense, the serrated edge of relief is a form of tense equilibrium.

This tension distinguishes the geological edge from many botanical edges. A leaf edge may be thin and vulnerable, but it is part of living tissue. A mountain edge is a mass subjected to weight, fracturing, temperature, water and time. Its tension is mechanical and geomorphological. In both cases, however, the edge reveals the limit of form. Wherever there is an edge, there is a possibility of change. An edge always indicates a transition.

Serrated edges of relief also demonstrate the relationship between form and light. Visually, mountain serrations are particularly pronounced through contrasts of light and shade. Sunlight highlights crests, while shadows emphasise ruptures, scarps and depth. This is not merely an aesthetic effect. Light helps make morphology visible. In images of relief, especially photographs or satellite imagery, the angle of illumination may radically alter the legibility of edges. Illustrations should therefore be selected in which the light emphasises rather than obscures the structure of the edge.

The illustrations for this section should show several types of active edge. The first image might present a serrated mountain crest as a line of drainage division and erosion (*Fig. 10*). The second might show a rock scarp or fault edge in which an abrupt transition of the surface and the exposure of strata are visible (*Fig. 11*). The third might be a comparative pair—'serrated leaf edge — serrated mountain edge'—emphasising the morphological invariant of the active periphery despite the difference in mechanisms (*Fig. 12*). Such a series would connect the geological and botanical levels of the Matrix.

A separate diagram showing the formation of a serrated edge of relief would also be useful. It could indicate internal cracks, more and less resistant rocks, the action of water and ice, rockfalls and screes. As a result of these processes, an initially even ridge line becomes serrated. Such a diagram would be especially important because it would show that serration is not an arbitrary visual association, but arises through specific processes. This would reinforce the scientific rigour of the chapter.

Image captions should be analytical. For example: 'A serrated mountain crest as an active periphery of relief: drainage divide, erosion and material resistance'; 'A rock scarp as an edge of exposure: internal structure emerges at the surface'; 'Morphological comparison: a serrated leaf edge and a serrated edge of relief as different types of active boundary'. Such formulations preserve the connection with the Matrix without turning comparison into direct identification.

The serrated edges of relief lead into the concluding section of the chapter, in which geology will be considered as slow morphogenesis. The edge demonstrates with particular clarity that

terrestrial form is never complete. It is constantly being reworked. The crest erodes, the scarp retreats, the slope sheds debris, the valley widens, and the surface exposes new strata. Relief exists not biologically, but geologically: through time, force, material and environment. The serrated edge is one of the clearest signs of this slow activity.

Thus, within the hypothesis of the Unified Matrix of the Universe, serrated edges of relief may be considered geomorphological analogues of the active periphery. They demonstrate that the edge of a form is not a passive termination, but a zone of interaction, erosion, resistance, exposure and continuing formation. Mountain crests, scarps, faults, cliffs and rocky pinnacles show how the Earth's internal structure and the external forces of the environment create the complex outlines of relief.

The serrated edge of relief is therefore a key morphogenetic invariant at the geological level of the Matrix. It reveals the active boundary of terrestrial form, where pressure, fracturing, erosion, ice, water, gravity and material resistance become a visible contour. If the valley reveals the axis of relief, the serrated edge reveals its periphery. Together, they show that the Earth's surface is organised not only by centres and lines, but also by boundaries at which form is constantly exposed to the effects of the world and, through this interaction, acquires its final—though always temporary—morphological expressiveness.

13.5. Geology as Slow Morphogenesis

The geological level of the Matrix requires a particular understanding of time. In living nature, morphogenesis can often be observed directly: a seed germinates, a leaf unfolds, a flower opens its petals, a fruit forms and ripens, and a fern frond unfurls from a spiral coil. Geological processes unfold differently. They may last for thousands, millions or tens of millions of years. Mountains rise and erode slowly, valleys incise gradually, folds form under prolonged pressure, and the edges of relief are reworked by water, ice, wind, temperature and gravity. Geology may therefore be understood as slow morphogenesis—the formation of form on the scale of deep time.

This understanding does not mean that geological forms should be identified with living organisms. A mountain does not grow like a plant; a valley is not an organ; a ridge has no biological programme; and a fold in the relief does not open like a petal. Geology nevertheless demonstrates that form generation is not confined to life. Inanimate matter also undergoes processes of organisation, deformation, destruction, transport, accumulation and stabilisation. At the geological level, morphogenesis means not the development of an organism, but the prolonged formation of terrestrial structure.

This chapter has examined the principal elements of such geological morphogenesis: relief as an active surface, the mountain fold as an expression of pressure, the valley as an axis, and the serrated edge as an active periphery. These elements form an integrated system. Relief is the surface upon which the Earth's internal forces encounter external processes. Folds demonstrate the deformation of strata and the transformation of pressure into form. Valleys create axial lines of drainage, incision and structural exposure. Serrated edges record erosion, material resistance and the active interaction of form with its environment.

Geology as slow morphogenesis reveals the Matrix through a type of process different from that found in botany. In plants, form frequently moves from hidden potentiality towards an unfolded living structure: seed — shoot — leaf — flower — fruit. In geology, form passes through other states: initial mass — disruption of homogeneity — pressure or faulting — folding — uplift — erosion — exposure — destruction — transport — new accumulation. There is no living cycle here, but there is a cycle of matter and structure. The geological Matrix operates through the slow transformation of matter.

The principal feature of geological morphogenesis is that form frequently arises through stress. Stress is also present in botany: tissues grow, bend, unfold and resist their environment. In geology, however, stress becomes one of the principal form-generating factors. Pressure compresses strata; a fault disrupts integrity; gravity draws material downwards; water cuts through the surface; ice abrades slopes; and weathering erodes edges. Geological form is frequently the result of forces that simultaneously construct and destroy.

In this sense, geology demonstrates that the Matrix cannot be reduced to harmonious unfolding. It encompasses compression, bending, rupture, cracking, collapse, erosion, removal and sedimentation. Stone and relief teach us to recognise the productive role of destruction. Destruction may reveal internal structure, create a valley, form an edge, produce sedimentary material and prepare a new geological beginning. Geological morphogenesis is therefore not only a morphogenesis of construction, but also one of subtraction, removal, dissection and redistribution.

Relief demonstrates this dual movement particularly clearly. Mountains arise through uplift, but become visible and dissected through erosion. Valleys exist because the surface has been incised by flowing water or ice. Rock scarps arise where part of the material has been removed and part has survived. Serrated crests result not only from elevation, but also from selective erosion. Terrestrial form is therefore not simply that which has been created, but also that which remains after the prolonged action of forces.

Geological morphogenesis is always connected with matter. The form of relief depends upon the composition of rocks, their strength, fracturing, layering, solubility, resistance to weathering and capacity for deformation. The same process may create different forms in different materials. Water erodes soft rock differently from hard rock; a glacier acts differently upon massive bedrock and a fractured slope; and pressure manifests itself differently in ductile and brittle strata. The geological Matrix is therefore not an abstract geometry. It is always material.

Material in geology is not passive. It resists, cracks, bends, dissolves, crystallises, erodes, compacts, and preserves or loses its form. It is precisely the resistance of material that gives relief its expressiveness. If the Earth's surface were entirely homogeneous, its relief would be far less diverse. Differences in rock type, resistance, degree of fracturing and environmental conditions create morphological diversity. Form arises from heterogeneity.

This corresponds to the general logic of the Matrix: form begins not with emptiness, but with difference. In biology, difference manifests itself as centre and periphery, axis and lateral branches, layer and edge, tissue and surface. In geology, it appears as hard and soft rock, uplifted and downthrown blocks, resistant and eroded strata, crack and mass, channel and slope, ridge and valley. Difference makes direction, boundary and process possible. Without difference, there would be no relief as a legible form.

Geology as slow morphogenesis also demonstrates that the surface is not merely an external shell. The Earth's surface is an active zone in which the internal becomes external. Strata, folds, faults and rocks formed at depth may become exposed on slopes and scarps. Water and erosion may reveal what was hidden. A mountain may become a cross-section through the Earth's crust. A valley may expose the internal architecture of a rock mass. Relief is therefore not merely the outward appearance of the Earth, but a surface upon which its structure is revealed.

In this sense, geological relief may be compared with a section through stone, although on a larger scale. In a section through stone, layers, veins and internal lines become visible. In relief, folds, ridges, valleys, outcrops, scarps, faults and erosional systems become visible. Both stone and relief reveal the hidden through the surface. Stone does so within a small body; relief does so across the space of a landscape. Geology expands lithomorphogenesis into geomorphogenesis.

The concept of slow morphogenesis is particularly important for understanding mountains. A mountain appears static, yet it is a temporary state. It has been uplifted or brought into relief by geomorphological processes and has subsequently undergone erosion, dissection, weathering, glacial modification and the shedding of debris. Its form is not final. It changes, although often too slowly for the human eye to perceive. A mountain is therefore not frozen eternity, but a prolonged process that has temporarily assumed the form of a stable mass.

A valley is likewise a process, not merely a form. It may deepen, widen, fill with sediment, change its channel, inherit ancient structures, receive tributaries and form terraces. Its axis may be active or partly inherited, young or ancient, fluvial or glacial, tectonically determined or produced by erosion. The valley demonstrates how a line of movement becomes a spatial system. It is one of the principal forms of geological time because a past flow is preserved within it as relief.

The fold demonstrates slow morphogenesis through pressure. Strata that may once have been relatively level become bent, compressed, uplifted, ruptured or exposed. In a fold, time is expressed not as a succession of strata, but as deformation. The fold tells us that form has changed under the action of force. It is therefore one of the most powerful geological signs of the Matrix. It demonstrates that a hidden structure may be transformed and subsequently become visible at the surface.

The edge of relief demonstrates slow morphogenesis through erosion. A serrated crest, cliff, scarp, fault edge or valley side is a zone in which form interacts most actively with the external environment. The edge erodes, sheds debris, retreats, exposes strata and produces detrital material. It is a boundary, but a mobile one. In geology, an edge is seldom final. It always lies between preservation and change. The edge of relief is therefore one of the principal zones of geological activity.

Geological morphogenesis also reveals the importance of scale. The same principle may be visible at different levels: a crack in a stone, a ravine on a slope, a valley within a mountain system, or a fault in the Earth's crust; a layer in a stone, a layer within an outcrop, a stratum in a mountain mass, or a regional fold system; the edge of a fractured stone, the edge of a rock scarp, the edge of a ridge, or the margin of a plateau. These levels are not identical, but they may be connected through a logic of scale. Geology requires thought to move from the small to the large and from the large to the small.

It is particularly important here to avoid simplistic fractalism. Not every recurrence in relief constitutes strict fractality. Many geological forms do, however, demonstrate a hierarchy of scales: river networks, fracture systems, lines of erosion, ridges and valleys, scree structures and

coastlines. This hierarchy permits discussion of natural self-similarity in a limited sense. The essential task is to discern not outward resemblance, but recurring relationships: a principal line and lateral branches, a major edge and smaller edges, a primary fold and secondary bends, a main valley and its tributaries.

Geology as slow morphogenesis also reveals a distinctive form of memory. Stone preserves the memory of matter in its layers, veins, cracks and folds. Relief preserves the memory of landscape in ridges, valleys, terraces, scarps, outcrops, abandoned channels and glacial traces. This memory is neither conscious nor biological. It consists in the material preservation of a trace. The pressure has passed, but the fold remains. The flow has changed, but the valley survives. The ice has disappeared, but the glacial trough remains. Uplift has ceased, but the mountain system continues to exist.

This type of memory broadens the general philosophy of the Matrix. In biology, form frequently carries a memory of the future: the seed contains the possibility of the plant. In geology, form carries a memory of the past: stone and relief record what has already occurred. Both cases, however, reveal the relationship between form and time. Form is not merely spatial; it is always temporal. In a plant, time is directed towards development and reproduction; in geology, towards accumulation, deformation, destruction and the preservation of traces. The Matrix manifests itself through different directions of time.

The geological level also demonstrates that form may be multitemporal. A single mountain landscape may contain ancient folds, later faults, young valleys, contemporary screes, old terraces, recent rockfalls, glacial traces and present-day channels. All of these coexist within one landscape. Relief cannot therefore be understood as a form of a single age. It is the spatial superimposition of different temporal phases. The geological Matrix is multilayered not only materially, but also temporally.

This multitemporality makes relief particularly difficult to interpret. The observer sees everything simultaneously, but the processes originated at different times. Geological reading therefore always requires reconstruction. It is necessary to distinguish what was primary from what was secondary, what was superimposed later, what was eroded, what was exposed at the surface, and what continues to operate. In this sense, geology teaches interpretative discipline. It does not permit us to rely solely upon an impression of form.

This is of fundamental importance to the hypothesis of the Matrix. The visual resemblance between a petal and folded relief, between a leaf vein and a valley, or between a serrated leaf and a mountain crest may be compelling. It must, however, be placed within a system of distinctions. A petal opens biologically; a mountain fold is exposed geologically. A leaf vein distributes substances through tissue; a valley collects water and sediment. The serrated edge of a leaf forms through growth; the serrated edge of relief forms through erosion and rock resistance. Only such differentiation makes the comparison scientifically admissible.

Geology as slow morphogenesis is therefore a crucial test of the maturity of the entire hypothesis. If the Matrix describes only outward similarities, it will remain weak. If, however, it is capable of preserving similar morphological relationships while rigorously distinguishing between their mechanisms, it becomes a metatheoretical language of form. Geology contributes precisely to this: it compels us to distinguish between visual image, morphological invariant and causal mechanism. This makes the hypothesis more rigorous.

The geological level also demonstrates that the Matrix manifests itself not in ideal form, but in form damaged by time. Plant forms frequently provide clear and harmonious models: the leaf, flower, fern and succulent. Geological forms are often uneven, ruptured, asymmetrical, eroded and incomplete. Yet it is precisely in this incompleteness that they become particularly significant. They reveal not abstract symmetry, but the real history of matter. Geology teaches us to recognise order in damage, rhythm in rupture and form in destruction.

This is especially important for the philosophical meaning of the Matrix. The world does not consist solely of perfect rosettes, flowers and spirals. It also encompasses cracks, collapses, faults, erosion, compression, destruction and remnants. If the hypothesis of the Matrix aspires to provide a broad account of form, it must include these processes. Geology supplies the necessary material. It demonstrates that form may result not only from growth, but also from resistance, compression and loss.

In this sense, the geological Matrix is more austere than the botanical one. Botanical form is frequently associated with life, colour, function and renewal. Geological form is associated with weight, time, pressure, destruction, slowness and stability. Both forms, however, are manifestations of becoming. One reveals life; the other, matter. One unfolds an organ; the other, the structure of the Earth. One demonstrates the rhythm of growth; the other, the rhythm of deep time.

The slow morphogenesis of geology also enables us to understand why relief is not only a scientific, but also a philosophical object. Mountains, valleys and rocks evoke a sense of grandeur not merely because of their size. They embody the depth of time. A human being sees a form that exceeds both an individual life and human history. Relief contains a duration inaccessible to direct experience. Geological form therefore broadens our perception of time and of humanity's place in the world. This philosophical impression must, however, be grounded in an understanding of processes rather than in mystification.

Mountains are not in themselves symbols of the Matrix. They become material for the hypothesis when structural features are identified within them: folds, axes, edges, valleys, strata, faults, surfaces, networks, rhythms and scales. Only through analysis of these features can relief be incorporated into a morphogenetic language. Otherwise, a mountain landscape remains merely a beautiful illustration. The task of this research is to transform the landscape into an object through which form can be read.

Geology as slow morphogenesis is also connected with the concept of unfolding. In botany, unfolding is often literal: a leaf unfurls, a flower opens, and a fern extends its frond. Geological unfolding is different. A fold may be uplifted and exposed. A valley may cut through the surface and reveal depth. Erosion may remove a layer and expose internal structure. A fault may bring a hidden boundary to the surface. Geological unfolding frequently proceeds through exposure, erosion and the revelation of depth.

This kind of unfolding may be described as negative opening. It does not add a surface, but removes material so that hidden structure becomes visible. A valley opens a mountain because it incises it. A scarp reveals a stratum because part of the surface has been eroded. A cliff exposes rock because the slope has lost stability. This differs from biological opening, in which a new surface is created through growth. Geology demonstrates that opening may also occur through subtraction.

Negative opening is an important contribution of the geological level to the hypothesis of the Matrix. It demonstrates that the path from the hidden to the manifest may proceed not only through growth, but also through destruction. This broadens the A–B–C–D model. In biology, B is frequently associated with the emergence of something new. In geology, B may take the form of a crack, fault or the onset of erosion. In biology, C is the development of tissues and organs. In geology, C is the increasing complexity of strata, valleys, edges, folds and erosional networks. In biology, D is the mature form. In geology, D is temporarily stabilised relief that already bears the traces of erosion and continues to erode.

Geology also demonstrates that D is always temporary. A mature mountain system may be eroded into a plain. A valley may be filled with sediment. A scarp may retreat. A ridge may be smoothed. Stone may become sand. At the geological level, therefore, there is no final form. There are only prolonged states of relative stability. This corresponds to the general logic of the Matrix as a cycle: stabilisation does not close the process, but prepares the way for further transformation.

The transition from D to a new A is particularly clear in geology. A stabilised form is eroded; its material is transported and accumulated, and subsequently becomes the source material for new structures. A mountain becomes sediment. Sediment becomes rock. Rock may once again be uplifted, deformed and cut through. This is the geological cycle of form. It has no biological inheritance, but it does possess material continuity. Matter passes from one morphological organisation into another.

This continuity of matter is the geological analogue of the memory of the Matrix. A form may disappear, but its matter continues to participate in new forms. A stratum may be eroded, but its particles become new sediment. A rock may disintegrate, but its minerals enter a new rock. A valley may be filled, but its sediment becomes part of a future structure. Geology demonstrates that form is mortal, but matter passes onwards. This is an important philosophical conclusion.

The geological Matrix also demonstrates that form depends upon its environment. Climate, water, ice, vegetation, elevation, gradient, rock composition, tectonic activity, sea level and gravity all participate in the formation of relief. Relief cannot therefore be explained solely by an internal code. It is the result of interaction. This is important for the hypothesis as a whole: the Matrix should not be understood as a rigid programme imposed upon matter. It is better conceived as a language of relationships in which form arises through the interaction of internal and external conditions.

Relief demonstrates the openness of a system particularly clearly. The Earth’s surface continually receives energy from the Sun, water, the atmosphere, gravity and the Earth’s internal processes. It is not isolated. Geomorphogenesis is therefore a process occurring within an open system. Water enters, flows, evaporates and returns as precipitation. Material is eroded, transported and deposited. The energy of elevation is converted into the work of flow. External and internal forces combine. At the geological level, the Matrix is an open dynamic system.

This openness makes relief mutable. Even where its principal structures persist for long periods, details change continually. Rain creates a new groove. A rockfall changes a slope. Glacial movement leaves a new form. An earthquake may alter a fault scarp. Prolonged weathering smooths an edge. Geological morphogenesis therefore proceeds at different rates, encompassing both rapid events and slow processes. A rockfall may occur within seconds, while the conditions leading to it develop over centuries. A valley may form over millions of years, while a flood alters its channel in a single day.

This combination of different rates makes geology particularly complex. Slow morphogenesis does not mean that everything occurs only slowly. It means that the resulting form is the product of a prolonged combination of processes, some of which are rapid events. An earthquake, rockfall, avalanche, flood or eruption may be brief, but its traces become incorporated into the long history of relief. Geological time therefore consists of a slow background punctuated by sudden events.

This is important within the hypothesis of the Matrix because form does not always arise uniformly. It may develop through abrupt shifts, thresholds and events after which the system passes into a new state. A crack may appear suddenly, although stress has accumulated over a long period. A rockfall may transform an edge instantaneously, although the edge had been eroding for a long time beforehand. A river may abruptly change its channel, although the valley has been forming for centuries. Geological morphogenesis thus combines gradual development with threshold transitions.

This returns us to the concept of stage B. In biology, B is the moment of emergence from a hidden state. In geology, B may be a threshold moment: a fault, crack, the onset of incision, a collapse, a change in base level or the beginning of uplift. After B, the structure develops differently. The geological level therefore demonstrates that the stages of the Matrix may encompass not only gentle opening, but also abrupt disruption. A threshold may take the form of a rupture.

Stage C in geology is an extended phase of increasing complexity. Following an initial fault or uplift, valleys, slopes, screes, tributaries, terraces, folded outcrops, edges and networks develop. A crack may give rise to a vein or a line of fracture. Uplift activates erosion. Once a valley has emerged, lateral forms develop. C is not a single process, but the complex development of a structure. It is C that makes relief rich and multilayered.

Stage D in geology is a stabilised but temporary form. We observe a mountain mass, valley network, serrated crest, rock scarp or folded slope. These appear complete, yet they continue to change. D is a form stable enough to be described, but not final enough to halt the process. Geological D always remains open to future erosion and a new cycle.

Geology as slow morphogenesis also demonstrates that the Matrix manifests itself through the relationship between line and surface. A valley is a line that creates the surfaces of slopes and a basin. A crest is a line that separates surfaces. A fault is a line that disrupts and organises blocks. A stratum is a surface that may be bent into a fold. A scarp is the edge of a surface that exposes depth. Relief consists of lines and surfaces, but these lines and surfaces are traces of processes. They are not geometric abstractions, but material forms of time.

In this sense, relief is a vast text without words. Ridges, valleys, scarps, slopes, terraces, channels, outcrops and cracks are ‘signs’ only in a metaphorical sense: they were not created to communicate, but they can be read. Geology teaches us to read form as a trace. Such reading requires knowledge, caution and the differentiation of levels. Yet it is precisely this kind of reading that makes relief important to the present research: it demonstrates that the world contains a structure that can be analysed as morphogenesis.

The visual material in this chapter should support this idea. The illustrations should not be merely beautiful mountain landscapes. They should reveal active surfaces, folds, valley axes, serrated edges, drainage lines, outcrops, strata, faults and the interaction of processes. Comparative pairs featuring leaves and petals should be analytical rather than decorative. Diagrams should

show the forces involved: tectonics, water, gravity, weathering and erosion. The visual sequence will then function as a scientific and philosophical argument.

The chapter's concluding illustration might present relief as a system of invariants: fold, valley axis, serrated edge, layer, surface, flow, destruction and stabilisation. Such a diagram would help connect all the sections of the chapter. At its centre might be a mountain landscape in which the following elements are identified: the ridge as an edge, the valley as an axis, the folded slope as the bending of a stratum, the channel as a flow, the scarp as an exposure, and scree as a transition towards new material. This would provide a visual expression of geology as slow morphogenesis.

The caption to such an illustration might read: 'Mountain relief as a system of slow morphogenesis: folds, valley axes, active edges, flows, exposures and zones of erosion.' This formulation emphasises that the subject is not a single element, but the interaction of structures. Relief becomes not a background, but a system of processes recorded in form.

This completes the transition from stone to relief. Stone revealed a form of slow growth within a small body; relief reveals slow morphogenesis on the scale of the Earth's surface. Stone records internal layers, veins and folds; relief exposes ridges, valleys, scarps and faults. Stone is a body of geological memory; relief is a surface of geological memory. Together, they form the lithomorphogenetic and geomorphogenetic level of the Matrix.

This level is especially important before the transition to subsequent chapters, in which other natural scales may be considered. Geology demonstrates that the Matrix should not be understood solely through soft and living forms. It encompasses hardness, pressure, erosion, exposure, sediment, fault, edge, depth, stability and duration. Geological material makes the hypothesis broader and more mature because it introduces the weighty materiality of the Earth.

Thus, geology as slow morphogenesis means that terrestrial forms may be described as prolonged, large-scale processes involving the unfolding, deformation and stabilisation of structure. Relief arises from the interaction of tectonics, water, gravity, climate, material and time. Its forms—mountains, valleys, folds, edges, scarps, channels and outcrops—are not static objects, but visible traces of processes. The geological Matrix manifests itself through the slow formation of the Earth's surface.

Mountain relief, folds, valleys and serrated edges constitute a large-scale geomorphogenetic level of the Unified Matrix of the Universe. Here the Matrix manifests itself as a system of relationships between layer and fold, axis and flow, edge and destruction, surface and depth, pressure and stabilisation, D and a new A. Geology demonstrates that form may be slow, heavy, tension-filled and partly eroded, yet still profoundly organised. For this reason, terrestrial relief constitutes one of the most important natural levels for understanding the Matrix as a universal language of the becoming of form.

Fig. 1. Mountain Relief as an Active Surface of Morphogenesis: Ridges, Valleys, Slopes, and Erosional Lines

Fig. 2. Folded Structure of a Mountain Slope: Pressure, Layering, and the Subsequent Exposure of Form

Fig 3. Scheme of the Interaction of Tectonics, Water, Gravity, and Weathering in the Formation of the Earth's Surface

Fig. 4. Morphological Pair: Flower Petals and Folded Mountain Relief as Different Manifestations of the Invariant of a Folded Surface

Fig. 5. Folded Mountain Slope: Layer, Pressure, Bending, and Subsequent Erosional Exposure

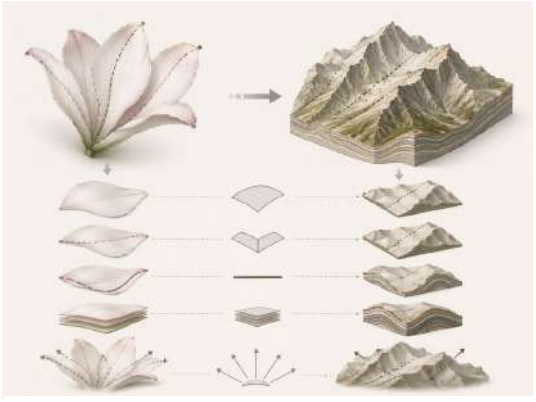

Fig. 6. Scheme of the Petal Logic of Relief: Surface, Fold, Margin, Layer, and Direction of the Unfolding of Form

Fig. 7. Valley as the Axis of Relief: Main Channel, Lateral Tributaries, Slopes, and Watersheds

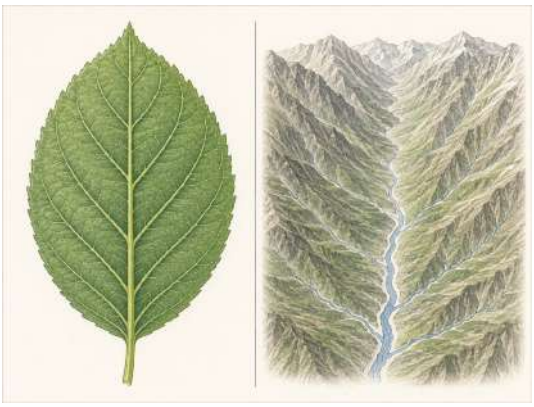

Fig. 8. Morphological Comparison: the Central Vein of a Leaf and the Valley Axis as Different Types of Surface Organisation

Fig. 9. Hierarchy of the Valley Network: Main Axis, Lateral Branches, and Active Margins of the Basin

Fig. 10. Jagged Mountain Ridge as an Active Periphery of Relief: Watershed, Breakdown, and Resistance of the Material

Fig. 11. Rock Ledge or Fault Edge: Internal Structure Reaches the Surface through Exposure and Breakdown

Fig. 12. Morphological Comparison: the Serrated Edge of a Leaf and the Jagged Edge of Relief as Different Types of Active Boundary

Fig. 13. Mountain Relief as a System of Slow Morphogenesis: Folds, Valley Axes, Active Margins, Flows, Exposures, and Zones of Breakdown

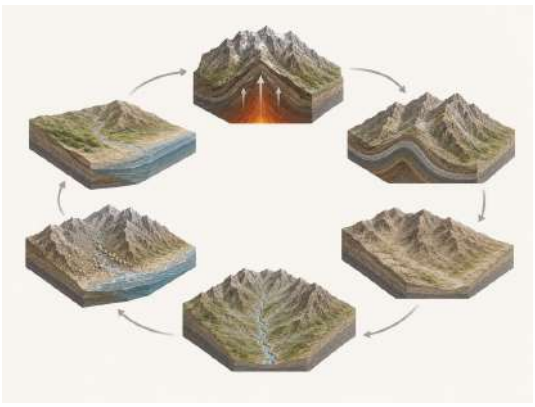

Fig. 14. Scheme of the Geological Cycle of Relief: Uplift — Folding — Erosion — Valley Network — Breakdown — Sediment — New Formation

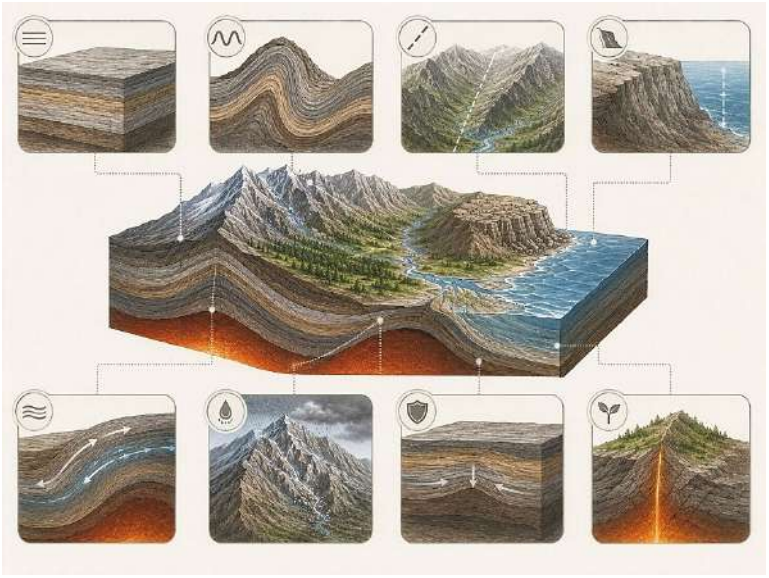

Fig. 15. Comparative Scheme of the Invariants of the Geological Matrix: Layer, Fold, Axis, Margin, Flow, Surface, Stabilisation, and New Beginning

Chapter Fourteen

The Ocean Floor and Submarine Forms

14.1. Submarine Relief as the Hidden Morphology of the Earth

The ocean floor represents one of the most significant yet least apparent levels of terrestrial morphology. In ordinary human perception, the ocean is most commonly experienced as a surface of water: horizon, waves, depth, reflections of the sky and the movement of currents. Yet this visible water surface conceals another world—a complex, differentiated, structured and morphogenetically active seafloor landscape. Beneath the water lie ridges, depressions, faults, volcanic cones, canyons, abyssal plains, seamounts, slopes, sediment waves, lava fields, spreading zones, dome-shaped forms and extensive tectonic lineaments. The ocean floor is the hidden morphology of the Earth.

It is precisely this hidden character that makes submarine relief particularly important to the hypothesis of the Unified Matrix of the Universe. Mountains, valleys and rock scarps on land can be perceived directly by sight. A person can see a ridge, slope, valley, edge, cliff or channel. In most cases, submarine relief is inaccessible to direct perception. It becomes visible through intermediaries: bathymetric maps, sonar imagery, three-dimensional models of the seafloor, geophysical profiles, underwater photography, expedition data and reconstructions. Submarine morphology therefore requires a particular mode of observation: one that is not merely contemplative, but also reconstructive.

The hidden morphology of the ocean floor demonstrates that the visible does not encompass the entire form of the Earth. The water surface may be relatively smooth, yet an extraordinarily complex structure lies beneath it. This has important philosophical implications. The form of the world is not always given directly. It may be concealed by its medium, depth, scale, inaccessibility or the need for technological mediation. Submarine relief reminds us that morphogenesis may occur beyond direct human observation without thereby becoming any less real or less structured.

The ocean floor may be regarded as a continuation of the Earth's geological surface, but within a different environment. Mountain relief is shaped by tectonics, water, gravity, weathering, erosion and climate. Submarine relief develops under the pressure of the water column and through tectonic processes, volcanism, sedimentation, submarine currents, landslides, faulting, hydrothermal activity, plate movement, turbidity currents and the prolonged redistribution of sediment. Here, the Earth's surface is not exposed to the atmosphere, but to water, pressure and deep-seated dynamics.

Submarine morphology is particularly important because it unites the lithospheric, hydrological and geomorphological levels. It is no longer simply stone, nor merely the relief of the land. It is terrestrial form submerged in water and transformed by submarine conditions. The ocean floor is both a solid planetary surface and part of the aquatic system. It is acted upon by tectonic forces

from below and by the mass of water above. In this sense, submarine relief constitutes a boundary zone between the lithosphere and the hydrosphere.

Within the hypothesis of the Matrix, such a boundary position is particularly significant. Form arises here not within a single medium, but at the intersection of different media. A submarine ridge is a lithospheric structure, yet its surface is reworked by sediment, currents, chemical processes and biological communities. A submarine canyon may be a continuation of a fluvial or slope system, but its development is connected with submarine currents and the gravitational movement of sediment. An abyssal plain may appear to be a tranquil plane, yet it is the result of prolonged material accumulation. A submarine volcanic cone is a form created by the deep-seated emergence of matter, but its external appearance develops within an aquatic environment.

The ocean floor differs from terrestrial relief not merely because it is concealed beneath water. It exists under different physical conditions. At great depths, pressure increases, direct sunlight is absent, environmental temperature and chemical composition have distinctive characteristics, sedimentary processes operate differently, biological life is organised according to other principles, and observation mechanisms are significantly more complex. Submarine forms should therefore not be transferred mechanically into terrestrial models. They may, however, be incorporated into a general morphogenetic scheme as a particular mode of terrestrial form.

Submarine relief demonstrates that the Earth possesses not one visible surface, but several levels of surface. There is the land surface, exposed to the atmosphere. There is the water surface, which conceals the depths. There is the surface of the ocean floor beneath the water column. There are also internal geological surfaces—strata, faults and boundaries between rocks. At the terrestrial level, the Matrix manifests itself not only along the planet's external contour, but also within these concealed surfaces. The ocean floor is one such hidden surface.

Visually, submarine forms may demonstrate striking morphological analogies with the structures already examined. Submarine ridges and faults may resemble folds in mountain relief. Sedimentary fans and submarine deltas may resemble leaf-like or fan-shaped structures. Submarine canyons and channel networks may resemble valley systems and leaf venation. Volcanic domes and seamounts may resemble seed-like or domed forms. Some bathymetric images display undulating, petal-like, radial or spiral motifs. All such analogies, however, must be strictly confined to the morphological level.

Submarine relief is not a flower, leaf or nebula. Its resemblance to biological and cosmic forms does not prove the existence of a common physical mechanism. It may, however, reveal the recurrence of certain morphological relationships: centre and periphery, dome and edge, axis and lateral branches, fold and layer, flow and branching, rupture and exposure, surface and hidden depth. It is these relationships that matter to the hypothesis of the Matrix. Similarity between forms becomes productive only when mechanism and invariant are distinguished.

The comparison between submarine forms and flowers or leaves is particularly important. A flower demonstrates radiality, a centre, petal-like opening, layering and periphery. A leaf demonstrates an axis, venation, a plane and an edge. Submarine forms sometimes display similar compositional relationships: a central dome and diverging lines; a submarine sediment fan and the radial distribution of material; a canyon as an axis with lateral branches; a folded seafloor surface as a rhythm of layers; or a volcanic form as a centred uplift. In submarine relief, however, these relationships arise from tectonics, volcanism, sedimentation, currents, pressure and gravity rather than from living growth.

Any comparison with nebulae must likewise be approached with caution. Certain submarine bathymetric structures, especially in visualisations, may resemble cloudy, undulating or petal-like forms similar to cosmic nebulae. A nebula, however, forms within a completely different physical environment involving gas, dust, radiation, gravity, magnetic fields, shock waves and stellar evolution. Submarine relief develops within a lithospheric-hydrospheric environment. It is therefore possible to speak only of a morphological analogy between complex surfaces, flows and distributions, not of identical processes.

The ocean floor is also important because it is one of the principal zones of planetary material renewal. New oceanic crust forms in the regions of mid-ocean ridges. In subduction zones, oceanic crust descends into the Earth's interior. Between these processes, the ocean floor preserves traces of extension, faulting, volcanism, sedimentation, plate movement and the Earth's deep-seated dynamics. Submarine relief may therefore be considered the surface of a planetary cycle of matter. This is not a biological cycle, but a geological cycle of the creation, movement, destruction and reworking of the Earth's crust.

From this perspective, the ocean floor is not a passive plane, but an active zone of formation. It may develop through the uplift of magmatic material, cooling, cracking, lava spreading, the formation of seamounts, sediment accumulation, faulting, subsidence, collapse, submarine currents and the reworking of material. Its forms frequently bear witness to movement that has already become stabilised in relief. Just as the stone wave recorded movement within a small body, and the valley recorded flow within a mountain landscape, so submarine forms record the movement of matter and water within hidden depths.

Submarine relief is especially closely connected with the concept of pressure. On land, relief is exposed to the atmosphere and its forms are reworked by wind, water, temperature and gravity. Beneath the sea, form is acted upon by the water column, which creates pressure and distinctive conditions for deposition, dissolution, transport and chemical interaction. This pressure should not be understood as the sole form-generating factor, but it is an important element of the environment. Submarine form arises under conditions in which matter moves beneath the weight of water and within a specific hydrodynamic regime.

Water acts differently in submarine relief than it does within a terrestrial valley. On land, water flows over the surface and cuts into it from above. In the ocean, water surrounds a form on all sides, while currents may transport sediment, form submarine canyons, create sediment waves, rework slopes and distribute material across the seafloor. Submarine water not only conceals relief, but also participates in its formation. The ocean floor is therefore a form created within a medium that both masks and shapes it.

This dual role of water is particularly important to the philosophy of form. Water conceals the seafloor from view, yet it is through water that many seafloor forms acquire their morphological history. Water is both veil and agent. It covers the relief, but transports sediment, creates currents, facilitates chemical processes and regulates the environment. In this sense, submarine relief is a form situated within the medium that shapes it. Here, the Earth's surface does not merely come into contact with water; it is immersed in it.

Submarine relief also broadens the concept of the edge. On land, an edge may be a crest, scarp, cliff or valley side. Beneath the sea, it may be the edge of a submarine canyon, the slope of the continental shelf, a fault line, the margin of a lava field, a rift scarp, the side of a depression, the wall of a submarine volcano or the boundary of a sediment fan. These edges are often invisible

without mapping, but morphologically they are as significant as terrestrial ones. They record transitions in depth, material, processes and directions of movement.

The submarine axis likewise has particular significance. A mid-ocean ridge may act as an extensive axis along which oceanic crust forms. A submarine canyon may serve as an axis of sediment transport. A fault zone may be an axis of displacement and structural organisation. A sediment fan may possess an axis along which material is distributed. Submarine relief therefore contains axes of different kinds: tectonic, hydrodynamic, sedimentary and volcanic. This makes it an important continuation of the theme of the valley as an axis, but within a hidden oceanic environment.

Submarine forms also frequently display fan-shaped and petaloid organisation. Sediment emerging from a canyon or slope zone may be distributed in a fan. Lava flows may spread across the seafloor, creating tongues, edges, domes and undulating fields. Landslide masses may produce lobate, petal-like contours. Such structures may resemble opening surfaces, but their origin lies in the movement of matter beneath water rather than in biological opening. They should therefore be described as ‘fan-shaped’, ‘lobate’, ‘petal-like’ or ‘morphologically resembling unfolded layers’, rather than as literal petals.

The hidden morphology of the ocean floor demonstrates particularly clearly the distinction between form and visibility. Form exists irrespective of whether it is seen by a human observer. For the science and philosophy of form, however, it becomes significant when it can be reconstructed, described, compared and incorporated into a conceptual system. A bathymetric map transforms the invisible seafloor into an image. A three-dimensional model makes depth resemble terrestrial relief. Sonar imagery reveals lines, folds, canyons and domes. Submarine morphology becomes visible through technological mediation.

This technological mediation demands methodological caution. A bathymetric visualisation is not a direct view through the human eye. It may exaggerate relief, use colour scales to represent depth, alter vertical exaggeration, and smooth or accentuate structures. Images of the ocean floor must therefore be read not as ordinary photographs, but as scientific reconstructions. This is particularly important for the present research. Captions to such images should specify whether they represent a bathymetric model, diagram or reconstruction rather than a direct underwater photograph.

Submarine relief as the hidden morphology of the Earth is also connected with the concept of scale. A human observer sees the ocean as a surface, yet structures of planetary dimensions lie beneath it. Mid-ocean ridges extend across immense distances. Trenches reach enormous depths. Seamounts and volcanic chains form extensive systems. Canyons may cut across the continental shelf and slope. At smaller scales, the seafloor contains microrelief, sediment waves, cracks, lava textures and biogenic structures. The ocean floor possesses a nested hierarchy of scales.

This nested structure enables the theme of self-similarity to be continued. Submarine canyon networks, fault systems, sediment waves, lava fields and rift structures may display recurring elements at different levels. Here, as before, excessive generalisation must be avoided. Not every complexity constitutes fractality. Not every seafloor network is analogous to a leaf. Where hierarchical relationships can be observed—a principal axis, lateral branches, smaller channels, active edges, repeated waves or lobes—it is nevertheless possible to speak of morphological scaling and natural self-similarity in a limited sense.

The ocean floor also introduces a distinctive category of invisible relief into the hypothesis of the Matrix. Terrestrial relief may be concealed by mist, snow, forest or distance, but in principle it remains open to sight. Submarine relief is concealed by the medium itself. This recalls the hidden structure of a seed, bud or stone, though on a different scale. A seed conceals a future form within its shell. Stone conceals its internal layers until it is cut. The ocean conceals the relief of its floor beneath water. In every case, form exists before it is revealed to an observer.

The types of concealment, however, differ. A seed is concealed biologically; a stone, internally and materially; and the ocean floor, environmentally and spatially. A seed reveals itself through growth. Stone is revealed through sectioning, fracture or polishing. The submarine floor is revealed through mapping, sonar, underwater photography and scientific modelling. The ocean floor therefore broadens the concept of revelation: here, revelation is not merely a natural process, but also an epistemic procedure. A human observer must construct an image of the hidden form.

This is important to the study as a whole because the hypothesis of the Matrix is concerned not only with what can be seen directly, but also with what must be reconstructed. The forms of the world frequently require interpretation. Submarine relief is one of the clearest examples of such a form. It demonstrates that morphological analysis can be directed towards concealed, deep-seated and technologically revealed structures. The Matrix cannot be reduced to a visible ornament. It may be discovered within mapped depths, where form is not available to ordinary observation.

Submarine forms also broaden the concept of a surface as a boundary. The ocean floor is the boundary between the solid Earth and the water column. This boundary, however, is not smooth. It is dissected, uplifted, downwarped, incised, covered with sediment, fractured and volcanically renewed. It is an active surface of interaction between the lithosphere and the hydrosphere. In this sense, submarine relief continues the theme of the active edge, although the edge now becomes an immense hidden plane of contact.

Submarine volcanic forms are of particular significance. They may be domed, conical, chain-like, lava-built or spreading in character. Submarine volcanism creates new surfaces that subsequently cool, crack, become covered with sediment, are colonised by organisms, erode and undergo further reworking. Dome-shaped forms are especially important to the following section, which will examine domes, ruptures and spreading. It may already be noted here that submarine form frequently arises through the emergence of internal matter into an aquatic environment.

Submarine faults and rift zones demonstrate another type of morphogenesis: form through rupture. Where the crust extends, cracks and becomes displaced, linear structures, scarps, depressions, ridges and zones of volcanism arise. Here, rupture does not merely destroy the surface; it organises it. It establishes an axis, edge, direction and site of material emergence. In this sense, the submarine fault continues the theme of the crack in stone and the fault edge in relief, but on the planetary scale of the ocean floor.

Submarine sedimentary forms demonstrate another mode of morphogenesis: form through accumulation and redistribution. Sediment may smooth relief, fill depressions, and form fans, waves, lobes and layers. It may conceal older structures while simultaneously creating new surfaces. Sedimentation is a gentle but powerful form-generating process. It transforms the movement of particles into a surface. The ocean floor is therefore not only a zone of faulting and volcanism, but also an immense archive of sedimentary processes.

In this sense, the submarine floor is once again a multitemporal structure. Beneath younger sediments may lie older strata, volcanic forms, faults, buried canyons and former surfaces. Visible bathymetry may show one level, while geophysical data reveal others. Just as stone contains layers from different periods, and relief contains both ancient and modern forms, the ocean floor contains superimposed phases of planetary history. It is an archive, but a concealed one.

Submarine morphology may also be connected with biological structures, but must not be reduced to them. Coral reefs, biogenic constructions, chemosynthetic communities, traces of organisms and carbonate platforms may participate in the formation of submarine relief. The principal emphasis in this chapter, however, is on geomorphological and tectonic forms. Biological factors may be acknowledged as one of the possible participants in submarine morphogenesis, but they are not the central subject of this section. The more important point is that the hidden surface of the seafloor possesses its own complex structural logic.

The ocean floor also offers a different understanding of the relationship between depth and form. On land, depth is often associated with a valley or cross-section. In the ocean, depth is the general environment. Seafloor relief is continually related to the vertical coordinate: shelf, slope, ocean basin floor, trench, ridge and seamount. Depth becomes part of morphology. The colour scales of bathymetric maps represent this verticality as a gradation. Submarine form is therefore always a form of depth.

Depth here is not merely the distance below the water surface. It is connected with pressure, temperature, illumination, chemical conditions, rates of sedimentation, the character of life and the types of processes involved. Submarine relief cannot therefore be understood as a terrestrial landscape that has simply been submerged. It is a distinctive geomorphological environment. Submarine depth alters the regime of form. It conceals and exerts pressure, slows certain processes, intensifies others, and creates conditions for specific structures.

Within the hypothesis of the Matrix, submarine relief is also important because it demonstrates the hidden continuity of the Earth. Land and ocean are not two entirely separate worlds. Continental margins, shelves, submarine canyons, sediment fans and tectonic structures connect them. A river may continue into a submarine canyon; a mountain system may extend beneath the sea; a volcanic chain may pass from islands to seamounts; and sedimentary material from the land may enter oceanic basins. The submarine floor is a continuation of terrestrial morphogenesis within a different medium.

This continuity helps connect Chapter 14 with Chapter 13. Mountain relief revealed axes, edges, folds and valleys on land. The ocean floor displays analogous categories within a hidden aquatic environment: submarine ridges, canyons, faults, slope margins, sediment fans, domes and depressions. Whereas the preceding chapter was devoted to visible geology, the present one addresses hidden geology. This is not a new world disconnected from the previous one, but a continuation of terrestrial form beneath the water.

Within the A–B–C–D model, submarine relief may be described provisionally. Stage A is a hidden or initial seafloor surface, source material, a zone of accumulation or an area of crust before the emergence of a pronounced structure. Stage B is a primary rupture, uplift, lava eruption, the beginning of a canyon, the onset of a sediment flow or the first line of differentiation. Stage C is the development of a complex structure: ridges, faults, sediment fans, lava fields, canyon networks, domes, lobes and waves. Stage D is a stabilised submarine form that can be read in bathymetric data or geological reconstruction. A new A may arise through sediment burial,

reworking, subduction, renewed volcanic formation or the incorporation of material into another cycle.

This scheme must not replace oceanography, tectonics or marine geology. It is a morphological language that facilitates the comparison of forms. The submarine floor demonstrates particularly clearly that stage D may remain invisible to ordinary observation. The form has stabilised, but remains concealed. It must be revealed through scientific imaging. Submarine relief thus adds another aspect to the A–B–C–D model: the stage of visibility may not coincide with the stage of formation.

Submarine morphology also raises the question of the aesthetics of scientific imagery. Bathymetric maps are often strikingly beautiful, with colour gradients of depth, relief shading, lines of ridges and depressions, fans, canyons and faults. Yet this beauty is produced by data visualisation. It helps us perceive structure, but may also intensify visual analogies. Discipline must therefore be maintained throughout the book: an image of submarine relief may be beautiful, but its scientific meaning lies in its morphology and processes, not in a decorative resemblance to a flower or nebula.

The illustrations for Section 14.1 should present the hidden yet complex structure of the ocean floor. The first image might be a bathymetric or scientifically informed artistic model of submarine relief, showing ridges, depressions, faults and sedimentary surfaces (*Fig. 1*). The second might be a comparative morphological pair consisting of submarine relief and a leaf-like or petal-like structure, with axes, edges and diverging forms emphasised but without asserting identity (*Fig. 2*). The third might be a diagram of the ‘visible ocean surface — hidden seafloor relief’, demonstrating that a complex morphogenetic structure lies beneath the smooth water surface (*Fig. 3*).

The third diagram is especially important. It could take the form of a cross-section: a calm water surface above, the water column beneath it, and still lower the ocean floor with its ridges, canyons, faults, domes and sedimentary layers. Such a diagram would immediately convey the philosophical meaning of the section: form may be concealed beneath another form. The water surface is the visible boundary, but the true morphology lies deeper. This would provide a powerful visual transition from terrestrial to submarine relief.

Submarine relief as the hidden morphology of the Earth prepares the way for the subsequent sections of the chapter. The following section will examine domes, ruptures and spreading as specific types of submarine form. Section 14.3 will describe the ocean floor through the principle of opening, in which stress and the movement of matter create complex surfaces resembling layers and petals. Section 14.4 will cautiously introduce the working concept of hydrogeomorphogenesis to describe the formation of structures under the influence of water, pressure, faulting and tectonic processes. Section 14.1 therefore establishes the foundation for the chapter as a whole.

Thus, the ocean floor is a hidden but active morphology of the Earth. It is invisible in ordinary perception, yet structurally extraordinarily rich. Its ridges, depressions, canyons, faults, domes, sediment fans, seamounts and rift zones demonstrate complex morphogenetic relationships: axis, edge, layer, flow, rupture, accumulation, spreading, pressure and stabilisation. These forms may be compared morphologically with flowers, leaves, folds and even cosmic structures, but only when their mechanisms are rigorously distinguished. Submarine relief demonstrates that the Matrix manifests itself not only within the visible forms of the land, but also in the hidden

depths of the planet, where the Earth's surface continues its slow, tension-filled and multilayered formation.

14.2. Domes, Ruptures and Spreading Forms

Submarine relief is particularly expressive where its surface displays three groups of forms: dome-shaped uplifts, lines of rupture and spreading structures. These forms are important to the hypothesis of the Unified Matrix of the Universe because they reveal different modes of surface formation: the ascent of matter from the depths, disruption of continuity and the distribution of material through the surrounding space. Whereas the preceding section considered the ocean floor as the hidden morphology of the Earth, it is now necessary to turn to the specific morphological motifs through which this concealed surface becomes legible.

Dome, rupture and spreading should not be understood as three rigid geological categories that apply equally to all submarine forms. They are, above all, morphological features that may have different physical causes. A dome-shaped form may be associated with a submarine volcano, lava dome, mud volcano, salt-related or sedimentary deformation, block uplift, a biogenic construction or another process. A rupture may be a tectonic fracture, rift zone, fault, canyon wall, edge of a collapse, lava-field boundary or zone of extension. Spreading may involve lava, sediment, landslide material, turbidity currents, mud or the movement of unconsolidated material. These forms must therefore be described with care: as dome-shaped, rupture-related and lobate spreading structures, rather than as objects whose origins have been predetermined.

The dome is one of the oldest and most universal morphological motifs. In biology, a dome may resemble a bud, seed, fruit, the rounded centre of a flower or a closed potential form. In geology, a dome may arise through uplift, accretion, material emergence, accumulation or local deformation of the surface. On the ocean floor, the dome acquires particular significance because it is often concealed beneath the water column and becomes visible only through bathymetry, sonar imaging or three-dimensional reconstruction. A submarine dome is a form that exists at depth yet retains a clear centred organisation.

Morphologically, a dome may be considered a centred uplift of the surface. It possesses a summit or zone of maximum elevation, slopes, a base, a periphery and a transition to the surrounding seafloor. If the dome is volcanic in origin, it may be associated with the emergence and subsequent cooling of magmatic material. If it is sedimentary or deformational, its origin will be different. At the level of form, however, a dome always demonstrates a local disruption of the plane: the seafloor ceases to be even and rises around a particular centre. This makes the dome an important morphogenetic object.

A dome in a submarine environment may be compared with a seed or bud only at the level of morphological closure and centredness. A seed contains a future form in the biological sense. A bud contains a future flower. A submarine dome contains no living programme of opening. It may, however, be a form of concealed stress, material emergence or local accumulation. It is therefore more accurate to regard it as a geological centre rather than as an organic potentiality. It demonstrates not life, but the tension-filled centredness of the Earth's surface.

Dome-shaped submarine forms may also be related to an initial A in the A–B–C–D model. If a dome arises as a local uplift or emergence of matter, it may be regarded as a primary centred form from which edges, fractures, slopes, flows, lobes or zones of erosion subsequently develop. This application of the model must remain provisional. A submarine dome is not a seed; it is a

local geomorphological body. It nevertheless demonstrates an important relationship: centre — uplift — slope — periphery.

Ruptures in submarine relief represent a different type of morphogenesis. Whereas a dome demonstrates uplift or accumulation, rupture reveals a disruption of surface continuity. A rupture is a line along which the seafloor cracks, shifts, opens, subsides, is cut or becomes divided. On the ocean floor, rupture structures may be associated with plate tectonics, rifts, faults, zones of extension, the edges of submarine canyons, landslides, lava fractures, collapses and other processes. In every case, rupture demonstrates that form arises not only through accretion, but also through disruption.

Rupture is particularly important to the Matrix because it is a geological analogue of the threshold. In biological morphogenesis, the threshold may be the moment of germination, the opening of a bud or the emergence of a leaf. In stone, the threshold was a crack or the first differentiation of a layer. In relief, it might be a fault, the beginning of a valley or a collapse. On the ocean floor, a rupture frequently initiates a new structure: matter may emerge through it; a ridge, canyon, depression or scarp may form along it; and it may become the site of hydrothermal activity or sediment transport. Rupture does not merely destroy the surface; it organises subsequent morphogenesis.

In this sense, rupture corresponds to stage B as the primary disruption of homogeneity. Before rupture, the surface may be relatively continuous. After rupture, a line of difference emerges: two sides, an edge, depth, direction and the possibility of displacement or material emergence. This line may become an axis. It may be filled, widened, exposed, displaced, extended or reworked. Rupture is therefore not merely a defect, but a structure-generating event.

Submarine ruptures are particularly pronounced in rift zones and on ocean-floor slopes. Where the surface is under extension, systems of linear scarps, fractures, depressions and parallel or intersecting lines may form. Visually, such structures may resemble leaf venation, cracks in stone or the lines of folds. Their origin, however, lies in tectonics, stress, faulting and the movement of the Earth's crust. Morphological analogy must therefore not become causal identification. What they share is only the structural motif of line, rupture and direction.

Rupture also creates an edge. In a submarine form, this edge may be the side of a fissure, a fault wall, a canyon scarp, the margin of a lava field, the boundary of a landslide body or the slope of a dome. It is not always visible directly, but in bathymetric data it may appear as a sharp change in depth, a line of shadow, a surface contrast or a structural boundary. The edge of a submarine rupture is an active zone in which collapse, sedimentation, fluid circulation, current movement, volcanism or further deformation may occur.

Spreading constitutes the third important motif of submarine morphology. Whereas the dome demonstrates centred uplift and rupture shows a disruption of continuity, spreading demonstrates the distribution of matter across a surface. It may take the form of a lava flow, sediment flow, submarine landslide, turbidity current, mud discharge, sediment fan or lobate structure on the seafloor. In each case, material moves and occupies space, creating tongues, lobes, waves, edges, steps, fans or petal-like outlines.

Spreading is particularly important to this chapter because it is in such forms that submarine relief may visually resemble petals, unfolded layers or undulating surfaces. A lava flow may create lobes and tongues diverging from a source. A sediment fan may be distributed radially or in a fan-like pattern. A landslide mass may possess frontal lobes. A turbidity current may leave

layers and sediment waves. These forms may indeed be morphologically similar to opening petals or leaf-like structures. Their mechanism, however, is different: matter moves under the influence of gravity, pressure, flow, viscosity, density, gradient and environment.

The petal-like character of submarine spreading forms must be described specifically as morphological. The lobe of a sediment fan is not a petal. A tongue of lava is not a biological organ. A submarine landslide does not open like a flower. All of these forms may nevertheless display common relationships: source, direction of movement, expansion, edge, periphery, superimposed layers, repeated lobes and the gradual attenuation of movement. It is these relationships that connect submarine spreading with the general language of the Matrix.

Of particular importance in spreading is the transition from a point or line to an area. Matter may emerge from a fracture, dome, canyon or slope and then spread across the seafloor. The source may be relatively localised, but the result becomes spatial. A line or centre is thereby transformed into a field. This transition has already been encountered in the leaf, where the midrib organises the blade, and in the valley, where the channel organises the basin. In the submarine environment, an analogous morphological principle manifests itself through the distribution of material across the seafloor.

Spreading also forms an edge. A lava lobe has a front. A sediment fan has a periphery. A landslide body has a limit of propagation. A submarine current has an area of deposition. These edges may be smooth, serrated, undulating, ruptured, stepped or multilayered. The edge of a spreading form is the line at which the movement of matter temporarily ceased or changed its regime. It therefore records the boundary of a process. In the book, this edge may be regarded as an analogue of the active periphery, now situated within a hydrogeomorphological environment.

Domes, ruptures and spreading forms are frequently interconnected. A dome may fracture, and material may emerge through the rupture. A rupture may become a flow channel. The flow may spread in lobes around the dome or along a slope. A submarine volcanic centre may create a dome, followed by lava flows, then fractures and finally sedimentary cover. A fault may create a scarp along which collapse occurs, after which the collapsed material spreads across the seafloor. These three motifs are therefore not isolated. They form a sequence and system: centred uplift — disruption — distribution.

Within the A–B–C–D model, this sequence may be described provisionally. A is the initial centre, dome, zone of accumulation or area of seafloor. B is a rupture, fracture, material emergence or disruption of the surface. C is spreading and the development of lobes, flows, waves and sedimentary or lava structures. D is a stabilised submarine form: a fractured dome, lava field, sediment fan, submarine slope or morphologically complete lobate structure. A new A may arise when this form is covered by sediment, reworked, becomes the foundation for a new flow or enters a larger geological cycle.

Such an interpretation is particularly useful when analysing images of submarine relief. If a bathymetric model shows a dome with radial or lobate forms, it may be described as a centred uplift with the peripheral distribution of material. If a fracture zone is visible, its rupture axis and edges may be identified. If fan-shaped deposits are present, it is possible to speak of spreading and sediment distribution. If undulating surfaces are visible, they may be described as morphological traces of movement or accumulation. Categorical claims about their origin must always be avoided in the absence of geological data.

Submarine domes may display strong analogies with the centres of flowers. In some visualisations, a dome is surrounded by radial lines, lobes, flows or fractures. Such a form may resemble the centre of a flower from which petals extend. In submarine relief, however, radiality may arise from lava spreading, sediment distribution, gravitational sliding, radial fracturing, slope processes or the shape of a submarine volcanic body. The correct formulation should therefore be: 'The dome-shaped submarine form demonstrates morphological centredness and a radial-lobate distribution of elements.' This is sufficient to connect it with the Matrix without crossing a scientific boundary.

Rupture structures may resemble leaf veins or cracks in stone. Where faults form a network, they may visually resemble branching. Their physical meaning, however, is different. A leaf vein distributes substances and supports tissue. A crack in stone records stress or provides a channel for mineralisation. A submarine fault records tectonic displacement, extension or disruption of the seafloor surface. What they share is linear organisation, not function. Comparative illustrations should therefore present the morphological motif of the line rather than asserting a common nature.

Spreading structures are particularly close to petal logic. A petal is a surface opening from its base towards its edge. A submarine lobe is a mass spreading from its source towards the periphery. In both cases, there is a direction from an internal or initial region towards an external edge. A petal, however, is created through tissue growth, whereas a lobe is created through the movement of matter. This distinction reveals an important methodological strength of the hypothesis: the same invariant of direction and edge may manifest itself in different material regimes.

Submarine lava forms provide a particularly clear example of spreading. Emerging from a fracture or volcanic centre, lava moves across the seafloor, cools, solidifies and forms flows, margins, pillow structures, tongues and surface folds. Water strongly affects the cooling and form of the lava. The resulting textures and relief features differ from those of terrestrial lava flows. Visually, some lava fields may possess an undulating or lobate structure. This makes them important material for the analysis of submarine morphogenesis.

Sediment fans and submarine depositional cones demonstrate another type of spreading. Material carried by currents emerges from a canyon or slope zone and is distributed across a gentler surface. This produces a fan in which a source, axis, lateral lobes, periphery, layers and zones of accumulation can be distinguished. Such a form is particularly close to leaf logic: a principal line of distribution with diverging lateral elements. A sediment fan, however, results from particle transport rather than tissue growth. It is a geological form of distribution.

Submarine landslides and mass movements create another type of lobate morphology. Large masses of sediment or rock may detach from a slope and spread across the seafloor, forming tongues, folds, frontal margins, blocks, hummocks and elongated forms. Such structures may be highly complex and may resemble folds in tissue or superimposed petals. They are, however, traces of gravitational movement, destruction and mass displacement. It is therefore preferable to use such terms as 'lobate structure', 'spreading front', 'landslide body' or 'morphologically petal-like distribution' in the captions.

Domes, ruptures and spreading may also be associated with hydrothermal activity. In areas of submarine volcanism and along mid-ocean ridges, hot fluids may emerge through fractures, mineral edifices may form, the chemical environment may change, and local relief structures may develop. These forms have their own specific characteristics, but morphologically they may

likewise display a centre, opening, edge, accretion, cone, fracture and flow. The submarine environment is particularly active here: lithosphere, water, heat and chemical substances form a complex system.

It is important, however, not to overload this chapter with detailed oceanographic classification. The purpose of the section is not to provide a comprehensive classification of submarine relief, but to demonstrate how the principal morphological motifs of the seafloor may be incorporated into the language of the Matrix. Dome, rupture and spreading provide useful analytical keys. They allow us to see the submarine floor not as a chaotic depth, but as a surface on which centre, line, edge, flow, layer, pressure, movement and stabilisation operate.

The dome reveals the centre. Rupture reveals the line and threshold. Spreading reveals the field and periphery. Together they form a simple yet profound morphological triad. The centre raises the surface or concentrates matter. The line disrupts and directs. The field distributes material. This triad may also be found at other levels of the Matrix: seed — rupture of the shell — growth; bud — opening — petals; stone — crack — vein; mountain — fault — valley; submarine floor — dome — rupture — lobate spreading. Each manifestation, however, has its own mechanism.

It is precisely the difference between the mechanisms that makes this triad scientifically significant. If all forms were explained by the same process, the analysis would be excessively crude. In reality, the Matrix as a metatheoretical language should reveal not identical causes, but recurring relationships. The submarine floor demonstrates these relationships within a hydrogeological environment. Here, centre, line and field arise through water, pressure, tectonics, sediment, lava, gravity and depth. Submarine forms therefore extend the Matrix without dissolving it into arbitrary analogy.

It is particularly important that submarine spreading forms frequently possess a soft, smooth and undulating geometry. This is associated with the movement of material across a surface, its viscosity, density and velocity, its interaction with water, and the processes of cooling or deposition. Visually, such forms may appear ‘organic’. Their organic quality, however, is morphological rather than biological. It arises because moving material within a medium creates smooth contours, lobes, fronts, tongues and repeated edges. If the visual relationship needs to be emphasised, the book should describe this as ‘quasi-petaloid’ or ‘petal-like’ morphology, without drawing a biological conclusion.

Submarine ruptures, by contrast, frequently possess a more rigid geometry. They may be linear, angular, stepped, abrupt and extensive. They reveal structural stress. When combined with spreading, rupture creates a contrast: a rigid line and a soft lobe, fracture and flow, edge and field. This contrast is particularly valuable for the visual sequence. It demonstrates that the submarine floor is not uniform: it combines abrupt and smooth forms, ruptures and spreading, domes and depressions.

The dome may likewise possess a dual nature: it appears soft and rounded, yet may arise from powerful stress or the emergence of matter. Its smooth exterior may conceal internal force. This brings it close to the bud only at the level of external closed form, while its geological meaning remains different. A dome is a form of local concentration. It demonstrates that a surface may be uplifted from within. In a submarine environment, such uplift is especially expressive because it disrupts a relatively smooth sedimentary or abyssal surface.

Submarine domes may also form chains or fields. Several seamounts or volcanic forms may be arranged along a line associated with tectonic processes, hotspots or structural directions. In

such cases, the dome ceases to be an isolated centre and becomes an element within a series. This is important to the Matrix: there need not be only one centre; centres may form a rhythm. The submarine floor may contain multiple local As connected within a larger system.

Spreading forms may also be superimposed upon one another. One flow overlies another, one sedimentary layer is deposited over its predecessor, and one lobe intersects or partially overlaps another. The result is a multilayered submarine surface. It resembles overlapping petals, but results from successive flows or deposits. Here the motif of the ‘former layer’ reappears: each lobe may be the trace of a distinct event, while the form as a whole results from their superimposition.

This superimposition makes the submarine floor a multitemporal structure. A dome may be older than the surrounding sediment. A rupture may cut across an older surface. A lava flow may overlie pre-existing forms. A sediment fan may cover faults. A landslide may erode and simultaneously bury part of the seafloor. An image of submarine relief therefore frequently shows not a single process, but a combination of processes from different periods. As with stone, the visible form must be read as a superimposed history.

From the standpoint of visual methodology, images of domes, ruptures and spreading forms should be selected so that the reader can discern the principal morphological features. For a dome, the centre, slope, base and transition to the surrounding seafloor are important. For a rupture, these are the line, edges, displacement or abrupt change in level. For spreading, they are the source, direction, lobes, front, undulating edges and superimposed layers. If a bathymetric model is used, the relief-shading visualisation should preferably emphasise the relief. If a diagram is used, it should be simple and analytical.

The first type of illustration for this section should be a submarine dome or seamount shown in bathymetric form (*Fig. 4*). Such an illustration should present dome-shaped uplift as a centred form of the seafloor. The second type should show a rupture or rift structure of the ocean floor (*Fig. 5*), in which the line of disruption, its sides, scarps and direction are visible. The third should show lobate spreading—whether involving lava, sediment or landslide material—in which matter diverges across the seafloor in the form of tongues, waves or petal-like forms (*Fig. 6*). A fourth illustration might provide a comparative diagram of the triad ‘dome — rupture — spreading’ (*Fig. 7*).

The comparative diagram is especially important. It may present three morphological states within a single logic: the dome as centred uplift, rupture as a line of disruption, and spreading as the expansion of material towards the periphery. Such a diagram can avoid unnecessary geological specificity and focus on form. It will help connect submarine relief with the general model of the Matrix. Centre, line and field are three fundamental relationships that can subsequently be compared with other levels.

Domes, ruptures and spreading forms also prepare the way for the following section, devoted to the principle of opening on the ocean floor. In the dome, hidden matter raises the surface. In rupture, the surface opens through disruption. In spreading, material unfolds across the seafloor, creating lobes and edges. All three motifs are associated with a transition from the hidden to the visible, from stress to form, and from a centre or line to a complex surface. This section therefore serves as a bridge between the general hidden morphology of the seafloor and a deeper analysis of the opening of submarine structures.

Thus, domes, ruptures and spreading forms are key morphological motifs of the ocean floor. The dome reveals local centredness and uplift; rupture, a threshold, line of disruption and active edge; and spreading, the distribution of matter, a lobate periphery and the stabilisation of movement in form. These motifs may visually resemble seeds, buds, petals, leaves, folds or waves, but their submarine nature is connected with tectonics, pressure, water, sediment, lava, gravity and the Earth's deep-seated dynamics. This is their significance for the hypothesis of the Matrix: they demonstrate that even the planetary surface concealed beneath water possesses a complex morphogenetic logic in which centre, rupture, flow and edge become visible forms of a deep-seated process.

14.3. The Ocean Floor and the Principle of Opening

The ocean floor is particularly important to the hypothesis of the Unified Matrix of the Universe because it allows the principle of opening to be examined within a concealed environment. On land, the opening of form may be directly visible: a leaf unfolds, a flower opens its petals, a mountain fold is exposed on a slope, and a valley cuts through the surface of the relief. In ordinary perception, the submarine floor remains concealed beneath the water column. Its forms cannot be observed directly, yet they exist, develop, deform, rupture, become covered with sediment, are revealed through bathymetric data and become objects of morphological interpretation. The ocean floor therefore demonstrates a distinctive type of opening: not only the natural opening of a structure, but also the epistemic revelation of a hidden surface.

The principle of opening in this section should not be understood in a literal biological sense. The ocean floor does not open like a flower. Submarine lobes are not petals, a rift fissure is not a shoot, and a lava field is not living tissue. Submarine relief may, however, demonstrate morphological relationships close to the logic of opening: concealed stress becomes a visible surface; internal matter emerges; rupture opens a new line; a flow spreads and forms a periphery; one layer overlies another; an edge records the boundary of movement; and a complex structure becomes legible after mapping. In this sense, opening is not a biological act, but a general morphogenetic relationship between the hidden and the manifest.

The ocean floor opens, above all, as a surface of planetary stress. Where the Earth's crust extends, compresses, shifts, ruptures or is renewed, ridges, rifts, trenches, faults, volcanic forms and zones of sedimentary accumulation arise on the seafloor. These structures are not accidental features of relief. They are connected with the planet's deep-seated dynamics. Within them, the Earth's internal energy acquires a surface expression. The ocean floor may therefore be regarded as one of the most powerful zones in which hidden geodynamics becomes morphologically legible.

Mid-ocean ridges are particularly illustrative of the principle of opening. In such zones, the Earth's crust may diverge, magmatic material rises, cools, creates a new surface, cracks, becomes displaced and gradually moves away from the axis of formation. Morphologically, this reveals a logic of opening through rupture and renewal. The surface of the ocean floor is not merely destroyed; it opens the possibility of new crust. Rupture becomes not the end of form, but the beginning of a new structure. This is of fundamental importance to the Matrix: opening may occur through the disruption of integrity.

Such opening differs from the opening of a bud. A bud opens from within outwards, releasing petals that are already formed or in the process of formation. A mid-ocean zone opens through tectonic extension and the emergence of matter. Morphologically, however, both cases involve a transition from closure to openness, from internal stress to the surface, and from a concealed state to a new form. The difference lies in the mechanism: biological growth in one case and geodynamic renewal in the other. What they share is the relationship through which internal organisation becomes visible as the boundary changes.

Faults and rift fissures demonstrate opening through the line. A line of rupture divides a surface into two sides, creating an edge, depth, direction and the possibility of further development. In stone, a crack may become a vein; in mountain relief, a fault may become a scarp or valley; on the ocean floor, a rupture may become a rift axis, a channel for the emergence of matter, a line of hydrothermal activity, a boundary between blocks or the beginning of a new structure. Cracks and ruptures therefore continue to function as universal morphological thresholds.

A line of rupture on the ocean floor is particularly important because it connects depth and surface. Heat, matter, fluids, magma and mineralised solutions may emerge through it. It may determine the direction of a ridge or canyon. It may organise a structure extending for many kilometres. The line of rupture thereby becomes an axis of opening. Within it, the Earth's concealed internal state acquires a pathway towards external form. A submarine fault may therefore be regarded as one of the most expressive signs of geological opening.

Submarine volcanic forms reveal another aspect: the emergence of matter. A volcanic cone, lava dome, lava field, submarine flow or chain of seamounts demonstrates that internal matter may become a surface. Magmatic material rises, enters the aquatic environment, cools, solidifies, cracks, accumulates and forms new relief bodies. Here, opening is connected not only with a line of rupture, but also with the materialisation of what was internal. That which once lay at depth becomes part of the ocean floor.

Submarine lava is particularly expressive as a form of opening. It emerges from a fissure or crater, spreads, is cooled by water, and forms folded, pillow-shaped, lobate or undulating structures. The movement of matter is rapidly stabilised in form. Lava appears to unfold across the ocean floor, but this opening occurs through flow and solidification rather than growth. Morphologically, a lava flow may resemble a fold of fabric, a petal-like lobe or a wave, but physically it is a form of cooling matter within an aquatic environment.

Sedimentary processes produce a gentler type of opening. Material is transported by currents, detached from slopes, discharged from canyons and distributed across the seafloor, forming fans, lobes, waves, layers and surfaces of accumulation. Here, opening occurs not through the emergence of magma, but through the distribution of particles. The ocean floor becomes a place where matter is gradually deposited in layers, covers older forms, creates new planes and conceals earlier morphology. Sediment simultaneously reveals the movement of a current and conceals the more ancient seafloor.

This reveals the dual nature of submarine opening. One process makes the hidden visible, while another covers it once again. A fault exposes a structure, and sediment buries it. Volcanism creates a new surface, and sedimentary layers gradually mask it. A submarine canyon incises a slope, but later deposits may partly fill it. The ocean floor continually exists between opening and concealment. This makes it a particularly complex object of morphogenetic analysis.

On land, erosion frequently reveals the internal structure of relief. Beneath water, opening may occur differently. Submarine currents may incise sedimentary strata, form canyons, remove material from slopes and create exposures. At the same time, sedimentation may smooth and cover the relief. The ocean floor is therefore a surface on which opening and covering operate simultaneously. It does not merely reveal geological history, but superimposes new pages upon older ones.

This circumstance is particularly important to the concept of the Matrix. The Matrix should not be understood as a structure that has been revealed once and remains permanently visible. In a submarine environment, form may appear, disappear beneath sediment, be revealed again by faulting, become deformed, overlain and reworked. Opening is a phase rather than a final state. The ocean floor demonstrates that form may be temporarily manifest, then concealed again, and subsequently reopened within another context.

The ocean floor is also revealed through the relief of depth. Bathymetry displays differences in elevation and depth, transforming an invisible submarine surface into a legible map. Colour scales, shaded-relief models and three-dimensional images make ridges, canyons, depressions, trenches, domes and sedimentary fields visible. This is not the natural opening of the form itself, but its revelation to knowledge. It is nevertheless of enormous importance to the present study, since it is through such visualisations that the submarine Matrix becomes accessible to analysis.

In the case of the ocean floor, two levels of opening must therefore be distinguished. The first is geological opening: rupture, the emergence of matter, spreading, exposure, erosion and the formation of a new surface. The second is epistemic opening: scientific mapping, bathymetric visualisation, sonar, geophysical profiling and modelling. The first level concerns the processes of the Earth itself. The second concerns the means by which human beings make these processes visible. Both levels are important, but they must not be confused.

Geological opening creates relief. Epistemic opening creates an image of that relief. If a submarine structure appears petal-like on a bathymetric map, this may result from an actual lobate distribution of material, but also partly from the method of visualisation, the selected scale, colour scheme and model lighting. Methodological caution must therefore be maintained when working with images of submarine relief. The form exists, but its visual appearance is always mediated by technical representation.

Submarine structures may be described as forms in which stress and the movement of matter create complex surfaces. This is the key formulation of the section. Stress creates rupture, uplift, displacement and deformation. The movement of matter creates flow, spreading, sedimentary distribution, lava fields and landslide lobes. Water provides an environment of pressure, cooling, transport and deposition. The result is a surface consisting of layers, edges, lobes, domes, fissures, waves, channels and fans. Such a surface may morphologically resemble petals, folds, leaves or nebulae, but its nature remains geological and hydrodynamic.

Petal-like submarine forms are particularly important. Within them, source, flow and periphery create a visual composition resembling opening. A sediment fan, for example, may possess a central axis and diverging lateral lobes. A lava flow may spread in tongues. A landslide body may possess frontal lobes and compressional folds. A submarine dome may be surrounded by radial fractures or flows. In all these cases, form possesses a direction from an internal or initial region towards the periphery. This is the morphological logic of opening.

Submarine ‘petal-like’ opening, however, is not the opening of an organ. It is the opening of matter within a field of forces. Material moves not because living tissue is developing, but because gravity, pressure, gradient, tectonic stress, density contrast, hydrodynamics or volcanic emergence is acting upon it. Here, petal-like form is the result of distribution. It is therefore more accurate to speak of a ‘lobately opened’ or ‘fan-shaped distributed’ structure rather than of actual petals.

The ocean floor allows the distinction between the form of opening and the mechanism of opening to be understood with particular clarity. The form may be similar: a centre, diverging elements, an edge, lobes and waves. The mechanism may be entirely different. In a flower, it involves tissue growth and the biological cycle. In submarine relief, it involves tectonics, magma, sediment, water, pressure and gravity. This distinction does not weaken the Matrix, but makes it more rigorous. The Matrix describes the recurrence of relationships rather than the identity of processes.

Submarine canyons also demonstrate the principle of opening. They cut through the shelf and slope, create deep axes of transport and connect shallower zones with deep-sea basins. A canyon is a line of incision and material transport. It exposes the internal layers of a slope, directs flows, and creates sides and active edges. In this sense, the submarine canyon continues the logic of the valley, but within a different environment. It is an axis of hidden relief.

A canyon on the ocean floor may be compared morphologically with the vein of a leaf or a valley in mountain relief. All three forms possess an axis and lateral elements. A leaf vein distributes substances through living tissue; a mountain valley organises terrestrial runoff; and a submarine canyon transports sediment and currents within an oceanic environment. What they share is the axial organisation of a surface. Their material and functional natures differ. The submarine canyon is therefore another example of how the Matrix manifests itself through the recurrence of morphological relationships despite differences in mechanism.

The principle of opening is especially pronounced in zones of the continental slope. Here, the surface passes from the shelf towards the deep ocean floor, while steep gradients, canyons, landslides, sediment flows, scarps, ruptures and fans arise. The continental slope is an active edge between continent and ocean. It does not merely connect different levels of depth, but reworks material from the land, directs it downwards and creates submarine forms. This is a zone in which the Earth’s surface appears to open towards the depths.

Submarine landslides and slope processes reveal form through collapse. Material accumulated on a slope loses stability, moves, ruptures, spreads and forms blocks, folds, fronts and lobes. Here, opening occurs as a catastrophic or prolonged redistribution of mass. It may destroy the previous surface while simultaneously creating a new one. A submarine landslide is an example of how destruction becomes morphogenesis.

In this sense, the ocean floor continues one of the principal ideas of the geological part of the study: form may arise through destruction. Submarine ruptures, canyons, landslides, lava flows and sediment flows all demonstrate that the disruption of integrity is not merely a loss. It creates a new surface, a new edge, a new axis and a new layer. At the geological level, the Matrix encompasses not only harmonious unfolding, but also opening through rupture.

Submarine undulating structures demonstrate another type of opening—the revelation of movement through surface rhythm. Sediment waves, flow folds, undulating lava surfaces, relief ridges and submarine dunes may record the movement of water or material. They demonstrate

how a flow leaves a repeated pattern upon the seafloor. A wave in water moves, but a wave on the ocean floor may be a stabilised structure. This recalls the stone wave and the mountain fold: movement becomes form.

Sediment waves are particularly important as an example of the subtle interaction between flow and matter. A current transports particles, its velocity changes, sediment is deposited unevenly, and the surface acquires a rhythm. The result is a relief that may appear soft, almost fabric-like. Its origin, however, is connected with hydrodynamics and sedimentation. Here, water acts as a sculptor of the surface, but not externally, as rain does upon a mountain; it acts from within the submarine environment. This makes the ocean floor a distinctive realm of hydro-relief formation.

Volcanic and hydrothermal zones reveal form through heat and chemical interaction. Hot fluids emerge from fissures, minerals are deposited, and pipes, cones, irregular fields, local edifices and chemically altered surfaces may arise. These forms are not always large in scale, but they demonstrate the intense interaction between lithosphere and water. Here, opening is associated with the emergence of deep-seated solutions and the creation of new mineral structures. This constitutes another mode of submarine morphogenesis.

The principle of opening is also connected with the concept of the surface as a result. The ocean floor appears to be a foundation, but in reality it is the result of numerous processes. Its surface may consist of new lava, ancient crust, sedimentary cover, an exposed fault, a slope deposit, a biogenic construction, or a structure that was buried and subsequently revealed again. The ‘floor’ is therefore not simply the lowest part of the ocean. It is a multilayered morphogenetic surface. It must be read as the result of interaction among depth, water, matter and time.

This is particularly important to the philosophical understanding of opening. Opening does not always mean the appearance of something that did not previously exist. It sometimes means the manifestation of something that already existed but remained concealed. At other times, it means the creation of something new over something older, the destruction of a covering, or the superimposition of a new layer that simultaneously conceals and reveals the direction of a process. The ocean floor unites all these possibilities. It is a field in which opening and concealment continually pass into one another.

Several types of ocean-floor opening may be distinguished. The first is tectonic opening: faults, rifts, extension and displacement. The second is volcanic opening: the emergence of matter, domes, lava fields and seamounts. The third is sedimentary opening: fans, waves, lobes and layers of accumulation. The fourth is erosional-canyon opening: submarine canyons, incisions, sides and exposures. The fifth is gravitational opening: landslides, collapses and mass movements. The sixth is epistemic opening: bathymetry, sonar, modelling and mapping. All these types are important, but they belong to different levels of the process.

Tectonic opening is connected with deep-seated stress. Within it, the surface is disrupted because the Earth’s crust moves, extends or becomes displaced. Volcanic opening is connected with the emergence of internal matter. Sedimentary opening is connected with the distribution of particles across a surface. Erosional-canyon opening is connected with incision and the removal of material. Gravitational opening is associated with the loss of stability and the downward movement of mass. Epistemic opening concerns the process through which concealed form becomes visible to knowledge. Distinguishing these types makes the analysis of submarine relief more precise.

Within the Matrix, all these types may be described through common relationships: hidden state — threshold — movement — surface — edge — stabilisation. The hidden state may take the form of stress, matter, a layer, sediment or an invisible form. The threshold may be a rupture, emergence, the beginning of a flow, collapse or an act of mapping. Movement creates distribution. The surface records the result. The edge reveals the boundary of the process. Stabilisation transforms movement into form. This scheme does not replace geological science, but helps reveal morphological logic.

The ocean floor and the principle of opening also make it possible to broaden the concept of the 'petal' in a metaphorical but not biological sense. The petal has already been understood in this book as a former layer that has become a visible surface. A submarine lobe of sediment or lava may likewise be a former flow that has become a surface. In both cases, there is a transition from process to layer, from movement to form, and from an internal or initial source towards the periphery. The petal, however, is living, whereas the submarine lobe is geological. It is therefore possible to speak of the petal-like logic of a surface, but not of petals as such.

This logic is especially expressive in visual imagery. A submarine sediment fan may resemble an opened fan or leaf. A lava field may resemble layers of fabric. A canyon network may resemble venation. Rift zones may resemble cracks in stone. A bathymetric model may resemble a nebula. Every analogy, however, must be accompanied by a strict qualification: it concerns the morphological similarity of structure, not a common origin. This is essential to the scientific integrity of the study.

The ocean floor also helps demonstrate that opening may be multicentred. Several domes, multiple flow sources, branching ruptures, superimposed fans and intersecting canyons may coexist within a single area of the seafloor. There is no single centre as there is in a flower. Instead, a field of centres, lines and directions exists. The submarine Matrix is frequently distributed. This constitutes an important extension of the model: not every form is organised around a single centre; organisation may sometimes arise from multiple local sources and their interactions.

The multicentred character of the ocean floor makes it particularly close to complex systems. Local processes overlap, intensify or conceal one another. One flow covers another. One fault displaces a pre-existing structure. One sedimentary layer covers an older lava field. One canyon captures material from another. The result is a complex morphology that cannot be reduced to a single line of development. Here, the Matrix manifests itself as a network of relationships rather than a simple sequence.

Nevertheless, the A–B–C–D model may still be used as an analytical tool. For an individual submarine form, A may be the initial surface or centre; B, a rupture, the emergence of matter or the beginning of a flow; C, the development of lobes, layers, canyons, folds or fields; and D, a stabilised form of the ocean floor. Within a complex area of the seafloor, however, several such cycles may coexist simultaneously. This must be taken into account. The model helps analyse individual elements, but does not always describe the entire system as a single linear development.

The ocean floor also demonstrates that opening may be partial. Bathymetry may reveal the general relief without showing its internal structure. A geophysical profile may display layers beneath the seafloor without providing a visual representation of the surface. Underwater imagery may reveal details, but only locally. Knowledge of submarine form is therefore always fragmentary. In this sense, submarine relief resembles an ancient artefact or fragment of stone: it requires reconstruction from partial data. This reinforces the need for methodological caution.

The illustrations should demonstrate precisely this principle of opening. The first image might present a submarine structure in which lava or sedimentary lobes diverge from a rupture or centre, resembling an unfolded surface (*Fig. 8*). The second might be a diagram of dual opening—natural and epistemic—with the actual processes of the ocean floor shown on the left and the bathymetric visualisation that makes them visible on the right (*Fig. 9*). The third might be a comparative diagram of 'layer — petal — submarine lobe', emphasising the shared invariant of transition from a hidden or initial state to an opened surface (*Fig. 10*).

A particularly powerful diagram might depict the ocean floor as a multilayered surface: tectonic stress below, a fault above it, followed by the emergence of matter, then spreading, sedimentary cover and finally bathymetric visualisation. Such a diagram would demonstrate that opening possesses several levels: geodynamic, morphological, sedimentary and epistemic. It would be valuable because it would connect the natural process with its scientific representation.

The principle of opening on the ocean floor prepares the introduction of the concept of hydrogeomorphogenesis in the following section. If submarine forms arise at the intersection of water, pressure, faults, tectonics, sediment and the movement of matter, a working term is needed to designate this complex. Hydrogeomorphogenesis should be introduced cautiously, not as an established and universally accepted discipline, but as an analytical concept within the present study. It will make it possible to describe the formation of submarine structures as a distinctive regime of terrestrial morphogenesis.

Thus, through the principle of opening, the ocean floor demonstrates that the Earth's hidden surface may become form through stress, rupture, the emergence of matter, flow, spreading, sedimentation and subsequent stabilisation. Its structures may resemble layers, petals, folds, veins and nebulae, but their origins lie in geological and hydrodynamic processes. This constitutes their significance for the Matrix: the submarine floor demonstrates that opening is not an exclusively biological act. It may be geological, hydrodynamic, volcanic, sedimentary and epistemic. The hidden becomes manifest, movement becomes surface, rupture becomes an axis, flow becomes a lobe, and depth becomes a legible morphology of the Earth.

14.4. Hydrogeomorphogenesis

To describe the submarine forms examined in the preceding sections, it is necessary to introduce a specific working concept: hydrogeomorphogenesis. This term should be used with caution. It should not be presented as a definitively established and universally accepted scientific category intended to replace marine geology, geomorphology, oceanography, plate tectonics, volcanology or sedimentology. Within the present study, hydrogeomorphogenesis is proposed as an analytical designation for a distinctive type of form-generation occurring on the Earth's submarine surfaces under the influence of water, pressure, faults, tectonic processes, gravity, flows, volcanism and sedimentation.

The word 'hydrogeomorphogenesis' may be divided into three semantic components: 'hydro'—water and the aquatic environment; 'geo'—terrestrial matter, relief, crust, rock and sediment; and 'morphogenesis'—the becoming of form. In the broadest sense, hydrogeomorphogenesis therefore means the formation of terrestrial structures within an aquatic, predominantly submarine environment. This concept emphasises that the ocean floor is not merely a geological

foundation beneath water, but an active surface upon which water and terrestrial matter jointly participate in the creation of form.

Such a concept is necessary because submarine forms cannot be fully described solely through the logic of terrestrial relief. Mountains, valleys, scarps and edges on land form through contact with the atmosphere, rain, snow, wind, vegetation, temperature fluctuations and the exposed action of gravity. The submarine floor exists within a different environment. It is concealed beneath the water column, subjected to water pressure, supplied with sedimentary material from various sources, reworked by submarine currents, and may be associated with hydrothermal processes, submarine volcanism, rifts, trenches, landslides and plate movement. The ocean floor therefore requires its own morphogenetic language.

Hydrogeomorphogenesis is not opposed to terrestrial geomorphogenesis. Rather, it constitutes a particular mode of it. Whereas geomorphogenesis describes the development of terrestrial forms in general, hydrogeomorphogenesis emphasises those cases in which form-generation occurs within an aquatic environment or with the decisive participation of water as a medium and as an agent of pressure, transport, cooling, deposition and concealment. In this sense, submarine relief is a continuation of the geological Matrix, but one that exists within a different physical and visual regime.

The principal feature of hydrogeomorphogenesis is that water acts not only as an external agent, but also as the environment within which form exists. On land, water more frequently acts as a current, rain, snow, ice, river or temporary watercourse affecting a surface. In the ocean, water continually surrounds the relief. It conceals and exerts pressure upon it, transports sediment above it, cools lava, participates in chemical reactions, sustains submarine currents, influences the distribution of particles and creates conditions for life. Submarine form exists within water rather than merely beside it.

This circumstance makes submarine relief a distinctive object for the hypothesis of the Unified Matrix of the Universe. Here, form is not given as an exposed surface. It is submerged. It is concealed yet active. It forms through interaction between the solid and the liquid, the deep-seated and the surficial, the tectonic and the sedimentary, and the destructive and the accumulative. Hydrogeomorphogenesis may therefore be regarded as the morphogenesis of the boundary between the lithosphere and the hydrosphere.

Understood in this way, the ocean floor is not a ‘floor’ in the everyday sense, but an active boundary of planetary processes. Above it lie the water column, currents, pressure, sediment, and biological and chemical processes. Beneath it lie the crust, magmatism, tectonics, faults, heat, deformation and plate movement. Between them lies the surface of the ocean floor, upon which these processes acquire form. It is precisely this boundary position that creates the distinctive morphological complexity of submarine structures. They belong to several systems simultaneously.

Hydrogeomorphogenesis encompasses several principal groups of processes. The first group consists of tectonic processes: extension, compression, faulting, block displacement, rifting, subduction, and the uplift and subsidence of areas of the ocean floor. The second consists of volcanic processes: the emergence of magma and the formation of seamounts, lava fields, domes, fissure eruptions and volcanic chains. The third consists of sedimentary processes: accumulation, transport, fan-shaped distribution, turbidity currents, the filling of depressions and the formation of sediment waves. The fourth consists of gravitational processes: submarine landslides, collapses, mass movements of sediment, spreading and frontal lobes. The fifth

consists of hydrodynamic processes: currents, near-bottom flows, sediment reworking, and the formation of waves and rhythmic structures. The sixth consists of chemical and hydrothermal processes: fluid discharge, mineralisation, hydrothermal edifices and changes in surface composition.

Each of these groups may produce its own forms. Tectonics creates lines, faults, ridges, trenches, rifts and scarps. Volcanism creates domes, cones, lava fields, fissures and seamounts. Sediment creates layers, fans, lobes, plains, waves and coverings. Gravity creates landslide bodies, collapses, spreading fronts and chaotic fields of blocks. Flows create channels, canyons, furrows, waves and distributary networks. Hydrothermal processes create local edifices, mineralised zones and altered surfaces. Together, they produce the complex morphology of the ocean floor.

Hydrogeomorphogenesis thereby demonstrates that submarine form is almost always multicausal. A single area of the ocean floor may simultaneously be tectonically disrupted, volcanically renewed, partly covered with sediment, reworked by currents and altered by chemical processes. A submarine form therefore cannot be interpreted as the result of a single simple mechanism without specialised data. Morphological analysis should identify features, but must not substitute them for geological diagnosis. This is one of the principal methodological requirements of the present chapter.

Within the hypothesis of the Matrix, hydrogeomorphogenesis is important above all as a level at which distinctive combinations of invariants may be observed: centre, axis, edge, layer, flow, rupture, spreading, dome, lobe, surface and stabilisation. These invariants have already appeared in biology, stone and mountain relief, but they manifest themselves differently on the ocean floor. A centre may be a submarine dome or volcanic edifice. An axis may be a rift line, canyon or direction of flow. An edge may be the side of a fault, a slope, the front of a lobe or a seafloor scarp. A layer may be sedimentary cover or a lava surface. A flow may involve the movement of water, sediment, lava or a landslide mass. A rupture may be a fissure, rift or fault. Spreading may involve the lava-derived or sedimentary distribution of material.

Hydrogeomorphogenesis is therefore an important connecting concept between geology and the general morphology of the Matrix. It makes it possible to demonstrate that the submarine floor is not an exception to the general logic of form. On the contrary, it demonstrates this logic within one of its most complex regimes: form is concealed, processes are multicausal, the environment is dense and pressurised, observation is technologically mediated, and morphological analogies with other levels are both particularly powerful and particularly susceptible to oversimplification.

The danger of oversimplification arises from the fact that submarine forms may visually resemble flowers, leaves, petals, folds, nebulae or fractal structures. Bathymetric images sometimes create the impression of enormous opened petals, radial fans, branching veins or cosmic clouds. Such visual resemblance, however, does not in itself constitute evidence of a common physical origin. Hydrogeomorphogenesis should be introduced precisely in order to provide a disciplined language for these analogies. We may say that forms are ‘morphologically similar’, ‘structurally comparable’ or ‘demonstrate a shared invariant’, but we must not assert causal identity without evidence.

In this sense, hydrogeomorphogenesis performs a methodological function. It makes it possible to maintain three levels of analysis. The first is the scientific-geological level: which processes might have formed the structure in question. The second is the morphological level: which forms and relationships are visible within the structure. The third is the philosophical-mathematical

level: how these relationships are incorporated into the language of the Matrix as a universal scheme of the becoming of form. If these levels are conflated, the hypothesis will lose its rigour. If they are distinguished, submarine relief becomes exceptionally powerful material for analysis.

Hydrogeomorphogenesis also helps clarify the concept of water within the book. Until this point, water has been considered primarily as an agent of terrestrial relief: it erodes, transports, incises valleys, and forms channels and terraces. Water now becomes the environment within which the entire form exists. This is a fundamental transition. On land, water frequently leaves traces upon a surface. Beneath water, the surface continually exists within water. Seafloor form is therefore the result of prolonged coexistence with water. This makes hydrogeomorphogenesis a more profound concept than merely 'erosion by water'.

Within submarine morphogenesis, water may act as a covering. It conceals relief from direct view and makes form invisible within everyday perception. Water may act as pressure, establishing the physical conditions of depth. It may serve as a cooling medium, particularly for lava flows. It may serve as a medium for sediment transport. It may be a chemical participant interacting with minerals and fluids. It may be an environment for life, within which biological organisms participate in the formation of certain structures. Water therefore has no single function; its roles are multiple.

Pressure is the second key element of hydrogeomorphogenesis. Submarine depth means not only distance from the surface, but also increasing pressure. This pressure affects the physical environment, the states of substances, fluid movement, the conditions under which organisms exist and the character of the processes involved. Submarine forms cannot, of course, all be reduced to water pressure. Pressure nevertheless constitutes a constant background that distinguishes submarine morphology from terrestrial morphology. It makes the submarine environment denser, more enclosed and more specific.

Faults and fissures constitute the third element. They demonstrate that hydrogeomorphogenesis is not merely a gentle sedimentary process. The ocean floor may be rigidly ruptured, displaced, extended and deformed. Faults create linear structures, sides, scarps, canyons, zones of material emergence and axes of movement. They demonstrate with particular clarity that form may arise through disruption. Rupture is one of the principal thresholds of submarine morphogenesis.

Tectonics constitutes the fourth element. The ocean floor is connected with the movement of lithospheric plates, the formation and destruction of crust, mid-ocean ridges, subduction zones, transform faults and deep-sea trenches. These processes establish the large-scale architecture of the ocean floor. Volcanic, sedimentary, gravitational and hydrodynamic forms subsequently develop upon this architecture. Hydrogeomorphogenesis should therefore be regarded as multilevel: large-scale tectonic structure and smaller surface processes operate together.

Sedimentation constitutes the fifth element. In many regions, the ocean floor becomes covered with sediments that accumulate, are redistributed and compacted, form layers, conceal older relief and create new relief. Sediment is a material of memory. It records the arrival of matter, the action of currents, biological productivity, and climatic and geological conditions. Within submarine morphology, the sedimentary layer simultaneously conceals and preserves history. It may smooth a form, but it may also record a process.

Gravity constitutes the sixth element. On submarine slopes, material may lose stability, slide, collapse, spread and form landslide bodies and turbidity currents. Gravity acts through gradient,

density, sediment saturation, seismic events and the accumulation of mass. Beneath water, gravitational processes may be immense in scale yet concealed from direct observation. They create lobes, fronts, chaotic fields and sedimentary bodies. Within them, the transition from destruction to new form is especially apparent.

Flow constitutes the seventh element. This may involve a flow of water, sediment, lava, fluid or fragmental material. Flow creates direction. It transforms a source into a trajectory, a trajectory into a surface, and a surface into a layer or lobe. The logic of flow connects hydrogeomorphogenesis with the leaf, valley and river network, but once again only at the level of morphological relationships. In the submarine environment, a flow may be invisible, temporary, density-driven, deep-water or near-bottom, yet its traces may be preserved within the form of the ocean floor.

Combining these elements, hydrogeomorphogenesis may be defined as follows: it is the process through which submarine terrestrial surfaces form and are transformed under the combined action of the aquatic environment, pressure, tectonic stresses, faults, volcanism, sedimentation, the gravitational movement of material, near-bottom currents and the subsequent stabilisation of relief structures. This definition is sufficiently broad to encompass different types of submarine form, yet sufficiently cautious not to claim to replace specialised disciplines.

This definition makes it possible to apply the A–B–C–D model to submarine forms. Stage A may be the initial surface of the ocean floor, a zone of stress, a dome, a sedimentary area or a structure that has not yet been revealed. Stage B is a threshold: rupture, fissuring, lava emergence, the beginning of a flow, collapse, the onset of incision or a change in conditions. Stage C is the development of the structure: spreading and the formation of lobes, canyons, fans, layers, domes, fault systems or sediment waves. Stage D is a stabilised submarine form recorded through bathymetry, geophysics or underwater imagery. A new A may be a subsequent sedimentary covering, a new fissure, a new lava field, a new flow or another phase of the tectonic or sedimentary cycle.

At the submarine level, it is particularly important that D may remain concealed. A form may be stabilised yet invisible without instruments. A distinction between formation and revelation must therefore be added to the A–B–C–D model. Geological D is the formed structure of the ocean floor. Epistemic D is the moment at which that structure becomes visible on a map, model or image. This distinction was already introduced in the preceding section, but it becomes fundamental within the concept of hydrogeomorphogenesis. Submarine form exists before it is imaged, yet it enters scientific analysis through the image.

Hydrogeomorphogenesis also makes it possible to describe the ocean floor as a multilayered system. The first layer is tectonic architecture. The second consists of volcanic and fault-related forms. The third is sedimentary cover. The fourth consists of traces of currents, landslides and the redistribution of material. The fifth is the present-day surface visible through bathymetry. The sixth is the visual reconstruction created by human beings. These levels do not always coincide. A bathymetric surface may conceal a deep-seated structure; sediment may cover a fault; a fault may cut through sediment; and a flow may overlie an earlier lobe. The ocean floor is therefore not a single surface, but a system of surfaces.

This concept of a system of surfaces is particularly important to the Matrix. Earlier in the book, form was frequently examined as a visible structure: leaf, flower, stone or relief. The ocean floor requires us to consider form as a partially concealed system. One surface is visible in a model, another lies beneath sediment, a third is expressed in a fault, and a fourth is being created by an

ongoing process. In the submarine environment, the Matrix manifests itself not as a single contour, but as a superimposition of levels. This makes hydrogeomorphogenesis one of the most complex sections of the entire geological part.

Hydrogeomorphogenesis also demonstrates that submarine form may be simultaneously soft and rigid. Softness manifests itself in sediment, lobes, fans, waves, spreading and smooth contours. Rigidity manifests itself in faults, rifts, scarps, volcanic forms, fissures and tectonic lines. The ocean floor unites these two regimes. It may contain a sharp fault beside a soft sediment fan, a lava dome covered by sediment, or a canyon together with its lobate outflow. This combination makes submarine morphology especially expressive.

From the perspective of the philosophy of form, hydrogeomorphogenesis demonstrates that form arises neither from solidity alone nor from fluidity alone, but from their interaction. The solid crust fractures, water transports, sediment covers, lava flows and solidifies, a slope collapses, a current leaves a wave, and pressure establishes the conditions. Submarine form results from transitions between states: solid — liquid — unconsolidated — solidified — covered — ruptured — stabilised. Such form cannot be described through geometry alone. It requires a processual language.

It is precisely this processual character that makes hydrogeomorphogenesis important to the general hypothesis. The Matrix manifests itself not as a finished pattern, but as a sequence of relationships. A dome rises, a rupture opens, a flow spreads, a layer is deposited, an edge stabilises, and a new phase covers the old. These relationships may be observed at different scales and within different materials. Submarine relief demonstrates them within a concealed aquatic environment. Hydrogeomorphogenesis is therefore not a separate topic, but an extension of the entire model of the Matrix.

Hydrogeomorphogenesis also helps connect the ocean floor with cosmic forms, although once again this must be done cautiously. In bathymetric models, lobate, undulating and dome-shaped structures sometimes resemble nebulae or galactic clouds. This similarity may be visually powerful, particularly in colour visualisations. Their causes, however, are entirely different. Cosmic structures form under the influence of gravity, gas, dust, magnetic fields, radiation and plasma dynamics. Submarine structures form under the influence of water, tectonics, sediment, pressure and geological matter. Only the morphological logic of distribution, flow, edge and centre may be shared. Hydrogeomorphogenesis helps prevent these levels from being conflated.

The visual materials for hydrogeomorphogenesis should be selected with particular care. An effective illustration should show not merely a beautiful ocean floor, but the interaction of processes. A bathymetric model, for example, might display a rift, faults, domes and sedimentary fields. A diagram might show how water, pressure, tectonics and sediment flows shape the ocean floor. A comparative illustration might juxtapose a submarine fan with a leaf-like or petal-like structure, but it must include a caption indicating the difference between their mechanisms. The visual sequence should teach not resemblance in itself, but the disciplined interpretation of resemblance.

The first illustration for this section might be a diagram of hydrogeomorphogenesis as a system of factors: water, pressure, tectonics, fault, flow, sediment and the stabilised form of the ocean floor (*Fig. 11*). The second might show submarine relief as a system of surfaces: tectonic foundation, faults, lava or dome-shaped forms, sedimentary cover and the present-day bathymetric surface (*Fig. 12*). The third might be a comparative diagram in which submarine forms are compared with biological and terrestrial invariants: dome — seed or bud; canyon axis

— vein or valley; spreading lobe — petal-like surface; rupture — crack in stone or fault in terrestrial relief (*Fig. 13*). Such a sequence would establish the concept of hydrogeomorphogenesis visually.

The ultimate significance of the concept of hydrogeomorphogenesis lies in the fact that it makes submarine relief a fully fledged level of the Matrix. Without this concept, the ocean floor might be perceived merely as a continuation of ordinary geology or as a collection of visually interesting concealed forms. Hydrogeomorphogenesis demonstrates, however, that a distinctive combination of conditions operates here: water as an environment, pressure as a constant background, rupture as a threshold, tectonics as large-scale architecture, flow as direction, sediment as memory, spreading as opening, and stabilisation as temporary form. This makes the ocean floor an independent morphogenetic level.

At the beginning of the chapter, submarine relief was described as the hidden morphology of the Earth. Domes, ruptures and spreading were then examined as specific morphological motifs. This was followed by an analysis of the principle of submarine opening, through which stress and the movement of matter become a complex surface. The concept of hydrogeomorphogenesis now unites these lines within a single analytical framework. It demonstrates that the ocean floor is not a passive depth, but an active, multilayered, concealed and processual surface of the planet.

Following the examination of biological, lithomorphogenetic, mountain-relief and submarine forms, it becomes clear that the Matrix must be understood as a language of different modes of becoming: living growth, the stabilisation of stone, the dissection of relief and submarine opening. Each mode possesses its own mechanisms. Recurrent relationships may nevertheless be identified in all of them: centre, axis, edge, layer, flow, rupture, fold, lobe, surface, stabilisation and a new cycle. It is this that makes the hypothesis of the Matrix not a collection of accidental analogies, but an attempt to construct a metamorphological language.

Thus, in the present book, hydrogeomorphogenesis designates the process through which submarine terrestrial structures form under the influence of water, pressure, tectonic stresses, faults, flows, sedimentation, volcanism, gravitational movement and the subsequent stabilisation of form. This concept makes it possible to regard the ocean floor as a concealed yet active surface of morphogenesis, upon which terrestrial matter opens, ruptures, spreads, becomes covered, stabilises and re-enters a new cycle. This constitutes its significance to the hypothesis of the Unified Matrix of the Universe.

The ocean floor represents a distinctive hydrogeomorphogenetic level of the Matrix. Its forms are invisible to ordinary perception, yet possess a complex structural logic. Submarine domes, ruptures, canyons, lobes, sediment fans, lava fields, ridges and depressions demonstrate recurrent morphological relationships that may be compared with flowers, leaves, folds, stones and terrestrial relief only when their mechanisms are rigorously distinguished. The ocean floor demonstrates that the Matrix operates not only within the visible, but also within the concealed; not only on land, but also at depth; not only through growth, but also through pressure, water, rupture, flow, accumulation and the stabilisation of form.

Fig. 1. Submarine Relief as the Hidden Morphology of the Earth: Ridges, Depressions, Faults, and Sedimentary Surfaces

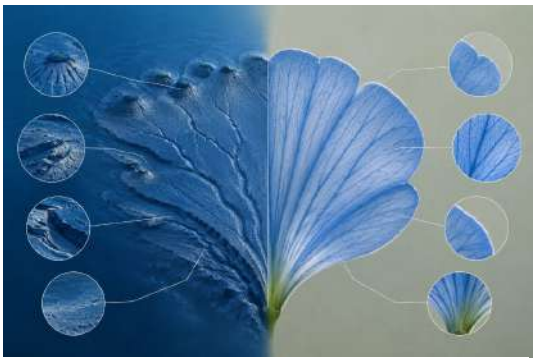

Fig. 2. Morphological Comparison of Submarine Forms and Leaf-Petal Structures: Axis, Margin, Fan-Shaped Distribution, and Hidden Surface

Fig. 3. The Ocean as a Double Surface: the Visible Water Surface and the Hidden Relief of the Seabed

Fig. 4. Dome-Shaped Submarine Form as a Centred Uplift of the Ocean-Floor Surface

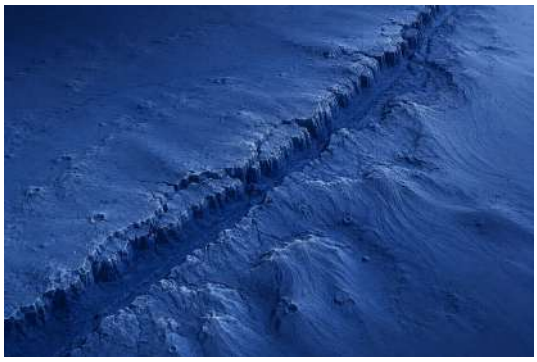

Fig. 5. Discontinuous Structure of the Ocean Floor: Line of Rupture, Margin, and Direction of Further Morphogenesis

Fig. 6. Lobate Spreading of Material across the Submarine Surface: Source, Flow, Periphery, and Stabilisation

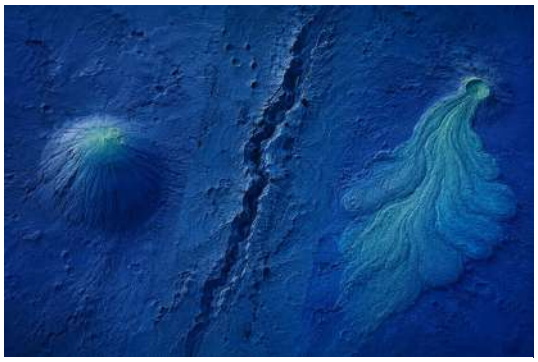

Fig. 7. Morphological Triad of Submarine Relief: Dome, Rupture, and Spreading

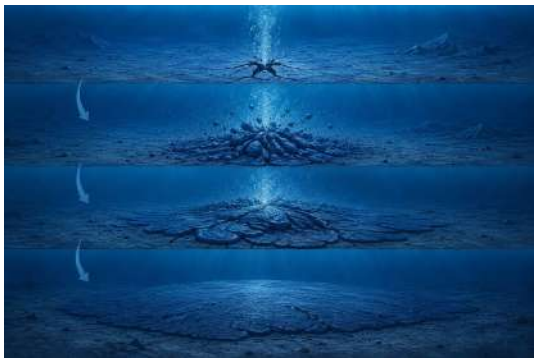

Fig. 8. Submarine Unfolding of Form: Rupture, Emergence of Material, Spreading, and Stabilisation of the Seabed Surface

Fig. 9. Double Unfolding of the Ocean Floor: Natural Formation of Structure and Its Bathymetric Visualisation

Fig. 10. Morphological Invariant of Unfolding: Layer, Petal, and Submarine Lobe as Different Types of Transition from the Hidden to the Surface

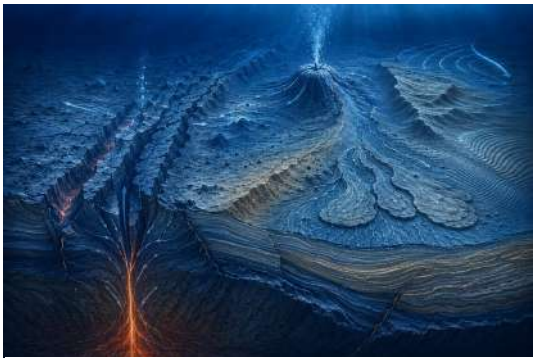

Fig. 11. Hydrogeomorphogenesis as the Formation of Submarine Structures under the Influence of Water, Pressure, Tectonics, Faulting, Flows, and Sediments

Fig. 12. The Ocean Floor as a System of Superimposed Surfaces: Tectonic Basement, Rupture, Volcanic Body, Sedimentary Cover, and Modern Bathymetry

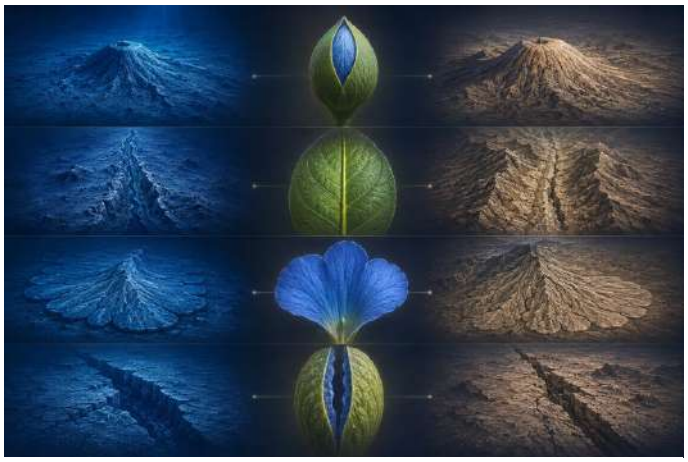

Fig. 13. Comparison of Morphological Invariants: Dome, Axis, Lobe, and Rupture in Submarine, Biological, and Terrestrial Forms

Part Five

The Cosmic Level of the Matrix

Chapter Fifteen

Nebulae as Forms of Cosmic Morphogenesis

15.1. The Cosmic Cloud as a Non-Equilibrium System

The transition to the cosmic level of the Matrix requires particular methodological caution. The preceding chapters have examined biological forms, stone structures, mountain relief and the submarine surfaces of the Earth. All these levels have already demonstrated that form may arise within different material regimes: through living growth, mineralisation, pressure, erosion, rupture, flow, sedimentation and stabilisation. The cosmic level introduces a still broader scale. Here, the objects of analysis are nebulae—immense clouds of gas, dust and plasma associated with the birth and death of stars, the interstellar medium, shock waves, radiation, gravity and magnetic fields.

A nebula is not a living organism, stone, mountain or form of submarine relief. It possesses no tissue, cells, roots, petals, mineralogical layers or terrestrial surface. Any comparison between a nebula and a flower, leaf, fold, stone or landscape must therefore be confined to the morphological level. A nebula may resemble a flower, petal, cloud, wave, shell, wing, smoke, flame, flow or fabric, but these visual associations do not constitute evidence of a common mechanism. Different physical processes operate at the cosmic level. These must be identified at the beginning of the chapter.

A nebula should be regarded as a non-equilibrium system. This means that its form is not an immobile geometric object. It arises, is maintained and changes through flows of energy, matter, radiation, gravitational interactions, shock waves, turbulence, magnetic fields, stellar winds, ionisation, cooling, compression and expansion. A cosmic cloud is a process temporarily perceived as a form. It is not ‘drawn’ in space, but formed through the complex dynamics of the interstellar medium.

It is precisely for this reason that the nebula is closely connected with the theme of morphogenesis, though in a specifically cosmic sense. Morphogenesis here does not mean the biological development of an organism. It means the formation of a large-scale structure within cosmic matter. Gas and dust do not form organs, but they may create filaments, shells, fronts, cavities, density knots, luminous regions, dark dust lanes, arcs, edges and elongated structures. These forms may exist for thousands or millions of years, changing in response to stellar activity, gravity and the interaction of matter with radiation.

The cosmic cloud is an open system. It is not enclosed within a rigid shell. Stellar radiation enters it, shock waves pass through it, and its matter may be compressed, dispersed, heated, cooled, ionised or condensed, participate in star formation, or be driven apart by stellar winds. The boundaries of a nebula are frequently diffuse, undulating, scalloped, ragged or radiant. It does not possess an edge in the same sense as a leaf or stone. Its edge is a zone of changing density, illumination, ionisation and temperature, and of interaction between gas and the surrounding environment.

The non-equilibrium nature of a nebula manifests itself primarily in the continual redistribution of its matter. Masses of gas and dust may be unevenly heated, compressed or rarefied. Matter is denser in one region and more diffuse in another; one region glows because of ionisation, while another remains dark because of dust; one area expands under the influence of stellar winds, while another contracts under the influence of gravity or a shock wave. A nebula is a field of differences. It is precisely the differences in density, temperature, velocity, illumination and composition that make its form visible.

This proposition is important to the entire hypothesis of the Matrix. Form begins not with absolute homogeneity, but with difference. In biology, difference creates an axis, tissue, edge and organ. In stone, difference creates a layer, vein or fissure. In relief, difference creates a ridge, valley, scarp or edge. In submarine morphology, difference creates a dome, rupture, lobe or sedimentary layer. In a nebula, difference creates a luminous core, dark lane, ionisation front, gaseous lobe, dust pillar, undulating edge, jet-like outflow or expanding shell. The material changes, but difference remains one of the fundamental conditions of form.

Nebulae may be of different kinds. Some are associated with star-forming regions, where dense molecular clouds contain the gas and dust from which new stars may form. Others are regions of ionised gas surrounding young, massive stars. Some are supernova remnants, within which ejected matter expands into the interstellar medium. Planetary nebulae are connected with late stages of stellar evolution, when a star sheds its outer layers and they are illuminated by its hot core. There are also dark nebulae, in which dust absorbs light and creates a silhouette against brighter background emission. The term ‘nebula’ therefore encompasses different objects that cannot all be explained through a single scheme.

This distinction is fundamental to the present study. If a nebula possesses the form of a ring, petal, spiral or shell, this does not mean that all such forms have the same origin. A ring-shaped form may be connected with the expansion of a shell, the projection of a structure, interaction with the surrounding environment or the particular conditions of observation. A petal-like form may be connected with bipolar outflow, the uneven distribution of matter, stellar winds, magnetic fields or dust structures. An undulating edge may arise from turbulence, shock fronts, density differences or the interaction of radiation with gas. Morphological similarity requires interpretation, but does not provide an automatic explanation.

The cosmic cloud as a non-equilibrium system demonstrates the role of energy particularly clearly. Without an influx, redistribution or release of energy, a nebula would not possess its observable luminous form. Stellar radiation may ionise gas and cause it to glow. Stellar winds may blow out cavities and create shells. Shock waves may compress gas and form fronts. A supernova explosion may eject matter and create an expanding remnant. Gravity may gather matter into denser regions. Energy is not added externally to form as an ornament; it participates in the morphology itself.

Radiation is one of the principal factors in the cosmic morphogenesis of nebulae. Starlight does not merely illuminate gas and dust, but physically changes the state of matter. Ionisation may transform neutral gas into luminous plasma. Radiation pressure may act upon dust particles. Ultraviolet radiation from young, massive stars may create bright regions, fronts and cavities. Light within a nebula is therefore not merely a means of visibility, but an agent of form-generation. This distinguishes cosmic form from an ordinary terrestrial photograph: here, light frequently participates in the physics of the object itself.

Dust also plays an essential role. It may absorb, scatter and re-emit light, creating dark lanes, contours, silhouettes, pillars and boundaries. In some images, it is precisely the dark dust that makes the nebula's form dramatically expressive: luminous regions are divided by dark veins, edges become ragged and the internal structure acquires depth. Cosmic dust may perform a morphological function resembling that of shadow, layer or veil, but its physical nature is different. It is not pigment within an image; it is matter participating in the structure of the cloud.

Gas is the principal medium of many nebulae. It may be diffuse, hot, ionised, molecular, atomic, turbulent, compressed or expanding. A gaseous form does not possess a solid contour. It is closer to a cloud, flow, smoke or plasma structure than to stone or a leaf. Stable forms on cosmic scales may nevertheless arise within gas: shells, arcs, jets, filaments, cavities, fronts and knots. This demonstrates that form does not necessarily require a solid surface. It may consist of a distribution of matter and energy.

Gravity acts within nebulae as an aggregating and structuring factor. Within dense molecular clouds, it may contribute to the compression of matter and the formation of stars. Gravity does not, however, act in isolation. It is opposed by thermal pressure, turbulence, magnetic fields, stellar winds and radiation. The form of a nebula consequently arises through competition between aggregating and dispersive processes. Some forces tend to concentrate matter, while others drive it apart and reduce its density. A nebula is the arena of this struggle.

It is precisely this struggle that makes the nebula a non-equilibrium system. It does not tend towards a simple static order. Its visible form is often a moment between compression and expansion, between the birth of stars and the dispersal of gas, and between the ejection of matter and its interaction with the interstellar medium. A nebula should therefore be understood as a temporary structure. It may appear beautiful and stable on the human scale of perception, but on the cosmic scale it changes, disperses, contracts, brightens, darkens, gives rise to new stars or ceases to exist as a distinct form.

Turbulence also plays an important role. Within clouds of gas and dust, the movement of matter is frequently non-uniform, vortical and multiscale. Turbulence may create filamentary structures, eddies, differences in density, ragged edges and complex internal patterns. It makes a nebula resemble a living, flowing form, although life is not involved. Turbulence demonstrates that order may arise not only through symmetry, but also through complex movement. Within a nebula, the chaotic and the organised continually interact.

Magnetic fields may influence the distribution of gas and dust, direct flows and contribute to the formation of filaments and other structures, particularly in combination with plasma processes. Their effects are not always visually apparent, but they are important to an understanding of cosmic morphogenesis. Cosmic form is not produced by gravity alone or by radiation alone. It results from numerous physical factors. A nebula as an object of the Matrix must therefore be regarded not as a simple, beautiful figure, but as a complex dynamic system.

Stellar activity is one of the most powerful form-generating factors. Young, massive stars may blow cavities into the surrounding gas, create luminous regions, form ionisation fronts and compress neighbouring areas of the cloud. Dying stars may shed their envelopes, creating the complex structures of planetary nebulae. A supernova explosion may produce an expanding remnant with filaments, shells and shock fronts. Here, a star acts not only as a source of light, but also as a centre of dynamic influence.

Many nebulae consequently possess a centre or region of increased activity. The centre, however, is not always the geometric middle. It may be a star, group of stars, dense core, star-forming region, source of an outflow, site of an explosion, maximum of luminosity or concealed dense region. The theme of centre and periphery within nebulae will be examined in detail in the following section. It is important to note already that a cosmic centre is not a symbolic ornament, but a physical node of processes.

A nebula may also possess a periphery, although that periphery is frequently unstable. The edge of a cosmic cloud may be scalloped, undulating, radiant, ragged, diffuse, dark, luminous or multilayered. It may be an ionisation front, a density boundary, a shock front, a veil of dust or a region of interaction with the surrounding environment. The edge of a nebula is not a line in the solid sense. It is a transitional zone. Yet it is often within this zone that the most expressive morphology appears: waves, pillars, filaments, arcs, petal-like contours and ruptures.

The cosmic cloud as a non-equilibrium system therefore continues the theme of the active edge. In the leaf, the edge was a zone of growth and interaction. In mountain relief, the edge was a zone of destruction and resistance. On the ocean floor, the edge was a zone of faulting, lobate spreading or sedimentary distribution. In a nebula, the edge is a zone of interaction among gas, dust, radiation, pressure and the surrounding interstellar medium. The material differs, but the relationship remains: the edge is not a passive boundary, but an active morphogenetic region.

Nebulae also make it possible to reconsider the concept of the layer. In space, a layer is not necessarily a solid plate or sedimentary horizon. It may be a shell of expanding gas, a dust lane, an ionisation front, a zone of different temperature or density, or the superimposition of luminous and dark regions along the line of sight. Layering within images of nebulae is frequently visual, but it may reflect genuine physical differences. The effect of projection must nevertheless be taken into account: what appears to be a layer in an image may result from the superimposition of three-dimensional structures within a two-dimensional projection.

This is particularly important to the methodology of the study. Images of nebulae are not simple photographs in the everyday sense. They are frequently created from data gathered in different regions of the electromagnetic spectrum, using colour coding, contrast processing and the combination of observations. The visual image of a nebula may therefore intensify its morphological expressiveness. This does not make the image false, but it requires understanding. The book must distinguish between the physical structure of a nebula and its visual representation. Just as bathymetry made the hidden form of the ocean floor visible, astrophotography and scientific visualisation make cosmic structure visible.

The cosmic level is especially sensitive to this problem. A nebula may resemble a flower, eye, wing, tree or wave because human perception tends to recognise familiar forms. Scientific-philosophical analysis must, however, move beyond association. It should ask: Where is the region of high density? Where is the source of radiation? Where is the interaction front? Which elements consist of gas and which of dust? Where might a shock wave be present? Where are the shell and outflow visible? Where are the edge, centre and rupture? Only in this way does a nebula become an object of morphogenetic analysis rather than merely aesthetic admiration.

Within the hypothesis of the Matrix, the nebula occupies a distinctive position because it demonstrates form without a solid boundary. Biological and geological objects frequently possess a more definite body. A flower, leaf, stone, mountain, valley and submarine dome are all forms associated with a surface or material body. A nebula is a distributed form. Its body is a cloud of matter. Its boundaries are transitions in density and luminosity. Its structure is the

relationship among gas, dust, light and movement. This broadens the concept of form to encompass field-like and cloud morphology.

Cloud morphology is particularly important to an understanding of the Matrix as a language not only of objects, but also of processes. A nebula cannot be fully described as a thing. It is closer to an event extended through time and space. Within it, compression, expansion, ionisation, cooling, ejection, dispersal, star formation and the interaction of flows take place. The form of a nebula is a visible cross-section of these processes. It resembles a single frame in cosmic becoming. The nebula is therefore one of the most powerful examples of form-as-process.

The nebula also demonstrates that morphogenesis may occur on scales far beyond the human. Its dimensions, durations, energies and distances are so immense that ordinary categories of perception become inadequate. A person sees an image, but behind it lie light-years of space, enormous masses of gas, stellar evolution and prolonged processes. Cosmic morphogenesis requires thought on the scale of the cosmos. It carries the Matrix from terrestrial geology into astrophysics, where form becomes the result of interactions between matter and energy within the interstellar medium.

This does not preclude morphological comparison. On the contrary, it is precisely the difference in scale that makes comparison interesting. If a nebula displays a centre, periphery, radiant edge, lobate structures, ruptures, outflows, filaments and shells, these relationships may be compared with those of a flower, leaf, mountain relief or submarine spreading form. Such comparison must, however, continually be accompanied by the qualification that it concerns morphological invariants rather than the identity of objects. The nebula and the flower will be specifically distinguished in Section 15.5.

At this stage, it is important to formulate the general principle: a nebula is a cosmic non-equilibrium system within which form arises from the interaction of gas, dust, radiation, gravity, magnetic fields, shock waves and stellar activity. This form may be centred, radial, filamentary, shell-like, lobate, scalloped, ruptured or diffuse. It may possess a bright core, dark dust lanes, luminous edges, expanding shells and outflows. All these features, however, must be read as traces of physical processes rather than as decorative imagery.

The nebula also gives new meaning to the concept of opening. In biology, opening was connected with the growth of an organ. In geology, it was connected with exposure, rupture, flow and the stabilisation of a surface. Within a nebula, opening may be associated with the expansion of a gaseous shell, the ejection of matter, the disruption of a cloud by stellar winds, the excavation of a cavity by radiation, the dispersal of dust or the propagation of a shock wave. Cosmic opening is the expansion of matter into space. It possesses no surface in the terrestrial sense, yet creates a visible structure.

The principle of opening may manifest itself especially dramatically in supernova remnants. An explosion ejects matter outwards, creating an expanding shell, filaments and shock fronts. In planetary nebulae, the outer envelopes of a star may create rings, lobes, bipolar structures or complex symmetries. In star-forming regions, stellar winds and radiation may rupture and hollow out a cloud. In all these cases, form arises through ejection, expansion and interaction with the surrounding environment. This will be examined in detail in Section 15.4.

It must already be emphasised, however, that the cosmic cloud is not in equilibrium. It is not a frozen ornament. It continually changes under the influence of forces. Its beauty is the beauty of process. In this respect, the nebula is close to mountain relief and the ocean floor: we observe a

temporarily stabilised form behind which lies prolonged dynamics. In space, however, these dynamics are connected not with water and rock, but with gas, dust, radiation and stars.

The nebula is also a multitemporal structure. A single image may simultaneously contain young stars, older dust clouds, regions of actively ionised gas, expanding shells, remnants of earlier processes, dense knots of future star formation and dispersing peripheral regions. The observer sees them together, although they belong to different stages of cosmic history. Like stone and relief, the nebula therefore requires a reconstructive mode of perception. Visible form is not merely a single moment; it contains history.

This multitemporality is intensified by the fact that cosmic objects are observed after a delay caused by the travel time of light. An image of a nebula shows the object as it existed in the past, since light requires time to reach the observer. This is significant to the philosophy of form: cosmic morphogenesis is always presented to us as a visible past. A nebula is not only a spatial structure, but also a message from time. Within the present study, however, this aspect should be used cautiously and not transformed into a mystical interpretation. It is a physical consequence of the finite speed of light and cosmic distances.

Visually, nebulae frequently appear alive. Their lines resemble tissues, their edges petals, their centres embryos, their shells flowers, and their filaments roots or nerves. This resemblance arises because the human eye recognises familiar morphological relationships: centre, flow, edge, branching, layer and wave. The scientific task is not to reject this visual intuition, but to discipline it. Visual similarity may be the beginning of analysis, but not its conclusion.

In this sense, the nebula represents a test for the hypothesis of the Matrix. If the hypothesis is reduced to the assertion that ‘a nebula resembles a flower’, it will be too weak. If, however, it demonstrates precisely which invariants may be compared—centre, periphery, opening, edge, radiality, lobation, rupture, outflow, layer, flow and fractal heterogeneity—while rigorously distinguishing astrophysical mechanisms from biological ones, the cosmic level will become one of the most powerful parts of the study. The analysis must be directed towards precisely this objective.

The cosmic cloud as a non-equilibrium system may be described through several categories:

1. Matter: gas, dust, plasma, molecular clouds and ionised regions.
2. Energy: radiation, stellar winds, shock waves, heat and explosive processes.
3. Force: gravity, pressure, magnetic fields and turbulence.
4. Structure: centre, core, shell, filament, edge, cavity, lobe, arc and rupture.
5. Time: star formation, stellar evolution, expansion, dispersal and compression.
6. Observation: spectral range, colour coding, projection, scale and visualisation.

These categories make it possible to interpret a nebula as a morphogenetic object.

The A–B–C–D model must likewise be applied to nebulae only provisionally. A may be a dense cloud, core, region of concentrated matter or concealed source of activity. B may be the onset of ionisation, compression, ejection, rupture, stellar wind, a shock wave or the formation of a central star. C may be the development of a complex structure: shells, lobes, filaments, edges, fronts, cavities, rays and density knots. D may be the observable nebula as a temporarily stabilised cosmic form. A new A may arise within dense regions where stars form or through the subsequent redistribution of matter within the interstellar medium. This scheme must not replace astrophysics; it is a morphological language.

It is particularly important that stage D is often the most aesthetically striking stage of a nebula, but remains physically temporary. We observe a magnificent form, yet it is not final. Gas disperses, stars are born, shells expand, dust is redistributed, shock fronts travel farther and luminosity changes. Cosmic form is therefore an event within a process. A nebula is beautiful precisely because it is out of equilibrium. Its beauty is the beauty of transition.

The illustrations for this section should present the nebula as a dynamic cloud rather than a decorative cosmic background. The first illustration might show an extensive nebula of gas and dust with luminous regions, dark dust lanes, filaments and complex edges (*Fig. 1*). The second might be a diagram of the physical factors of cosmic morphogenesis: gas, dust, radiation, gravity, stellar winds, shock waves, magnetic fields and dense knots (*Fig. 2*). The third might be a comparative diagram of a 'non-equilibrium system', presenting the nebula as a field of interaction among compression, expansion, ionisation and dispersal (*Fig. 3*). These images would establish the chapter's scientific framework.

A diagram presenting the nebula not as a beautiful cloud, but as a system of interacting processes, would be especially useful. A star or region of activity might be placed at the centre, surrounded by gas and dust. Arrows or visual flows might represent radiation, stellar winds, expansion, compression and shock waves. Dense regions might be indicated as potential sites of star formation, while edges might be presented as interaction fronts. Such a diagram would enable the reader to understand that the visible form of a nebula results from dynamic physics.

Thus, within the hypothesis of the Unified Matrix of the Universe, the nebula should be regarded as a dynamic non-equilibrium system rather than a static cosmic ornament. Its form arises through the interaction of gas, dust, radiation, gravity, turbulence, magnetic fields and stellar activity. It may possess a centre, periphery, edges, shells, lobes, filaments, ruptures and outflows, but all these elements are traces of astrophysical processes. It is precisely for this reason that the nebula may be incorporated into the language of the Matrix: not as a literal 'flower of the cosmos', but as a cosmic level of morphogenesis within which matter and energy create visible form in space.

The cosmic cloud is a form of process. It is not in final equilibrium, possesses no solid boundary and cannot be reduced to a visual metaphor. A nebula is a temporary structure of the interstellar medium within which compression and expansion, light and dust, gravity and radiation, centre and edge, rupture and shell create a complex morphology. At this level, the Matrix manifests itself as a language of the cosmic becoming of form—not through living growth or a geological surface, but through the dynamics of gas, dust, light and stellar energy.

15.2. Centre and Periphery in Nebulae

The concept of the centre is one of the keys to analysing form at every level of the Matrix. In biological structures, the centre may be expressed as a seed, growth point, the middle of a flower, the base from which petals open, the midrib of a leaf or the core of a fruit. In geological structures, the centre may manifest itself as the core of a stone, a crystallisation nucleus, dome-shaped uplift, volcanic centre, valley axis or region of tectonic stress. At the cosmic level, the centre acquires an even more complex character. Within a nebula, it may be luminous, gravitational, energetic, density-based, geometric, dynamic or observational. These types of centre do not always coincide.

When analysing nebulae, it is therefore necessary to avoid the overly simple assertion that ‘a nebula has a centre’. Some nebulae do indeed possess a visible bright central region, star, star cluster, luminous core or area of increased density. In others, the centre may be concealed by dust, displaced relative to the visible form, distributed among several sources of activity or not expressed as a single point at all. Some nebulae possess shell-like or ring-shaped structures, within which the centre is indicated by the symmetry of expansion. Others possess fibrous, chaotic or filamentary structures in which it is difficult to speak of a single centre. The centre of a nebula should therefore be regarded not as a predetermined point, but as an analytical category.

In cosmic morphogenesis, the centre may primarily signify a source of energy. If a young, massive star, hot stellar core, group of stars or remnant of an explosive event lies within or near a nebula, this region may determine the visible structure of the cloud. Radiation and stellar winds act upon gas and dust, ionising matter, blowing out cavities, creating fronts, illuminating some regions and leaving others dark. The centre is then not merely a visual region, but a dynamic source of the process. It shapes the periphery through the action of energy.

The central star often plays a particularly important role in planetary nebulae. It may illuminate and ionise the ejected envelope, creating a bright structure around itself. Morphologically, such nebulae sometimes resemble rings, shells, petals, bipolar forms or complex symmetrical structures. It is important to understand, however, that their ‘floral’ quality is a visual analogy rather than a biological relationship. The central star is not a seed in the botanical sense. It is a remnant of stellar evolution and a source of radiation that makes the gaseous envelope visible.

In star-forming regions, the centre may possess a different meaning. It may be a dense molecular core, a region of gas compression, a cluster of young stars, a source of ultraviolet radiation or a zone in which gas is passing into a new state. Such a centre may be concealed from visible light by dust and revealed through observations in other spectral ranges. In this case, the visible image of the nebula may not show the true physical centre. The morphological centre of the image and the astrophysical centre of the process may not coincide. This is an important methodological qualification.

The centre of a supernova remnant may likewise be ambiguous. The explosion creates an expanding envelope of matter, shock fronts, threads and filaments. The geometric centre of expansion may indicate the region of the original explosion, but visible brightness may be distributed unevenly because of interaction with the heterogeneous interstellar medium. If a compact object remains, it may have been displaced or may not be visible in an ordinary image. The centre of a supernova remnant may therefore be dynamic, historical or energetic, without necessarily being the brightest part of the image.

This diversity demonstrates that, at the cosmic level, the centre should be understood as a node of relationships. It is not always a point in the geometric sense. It may be a source of radiation, an area of increased density, a site of gravitational compression, a centre of expansion, a concealed core, the axis of a bipolar outflow, a group of stars or the region within which a process is most active. The centre is that from which, or around which, a morphogenetic event is organised. In this sense, the centre is not only a position, but also a function.

The periphery of a nebula is likewise not a simple external boundary. In a stone or leaf, the periphery is more apparent: there is an edge to the body, a boundary to the surface and a contour to the form. In a nebula, the periphery is the transitional zone between the cloud and the surrounding interstellar medium. It may be diffuse, ragged, undulating, radiant, scalloped, mist-like or altogether difficult to define. Yet the most expressive indications of process often manifest

themselves precisely at the periphery: ionisation fronts, undulating edges, dust projections, gaseous shells, shock waves, arcs, filaments, ruptures and regions where matter disperses.

Centre and periphery are connected within a nebula not statically, but dynamically. The centre may radiate, eject, compress, accelerate, illuminate, ionise or initiate movement. The periphery responds through changes in form: it expands, ruptures, deforms into waves, begins to glow, becomes obscured by dust, forms fronts or disperses. The nebula consequently becomes a non-equilibrium system of centre and edge. Its form is not merely a distribution of matter, but a trace of interaction between internal activity and the external environment.

In this respect, a nebula may be compared with a flower only at the level of morphological composition: centre — periphery — radiant or petal-like distribution. In a flower, the centre is associated with the reproductive organs and the biological organisation of the plant. Petals are arranged around the centre as the organs of the flower. In a nebula, the centre may be a star, dense region or source of radiation, while the periphery may be a gaseous shell or cloud structure. The mechanisms are radically different. The relationship ‘active region — diverging form — edge’ may nevertheless be compared morphologically.

Such a comparison is especially apparent in nebulae with radial or shell-like forms. If luminous matter surrounds a central star or region of activity, the eye perceives the structure as a flower, eye, ring, corolla or opening. Scientifically, however, it is more accurate to speak of a radially organised, shell-like or bipolar structure. The floral metaphor may be used only as an auxiliary visual analogy. It must not replace the physical description: radiation, gas, dust, shell, expansion, stellar wind, ionisation and density.

The centre of a nebula may also be luminous. Within an image, the brightest region appears central because it attracts the eye. Brightness, however, does not always correspond to the physical centre. A bright region may be a site of strong ionisation, an area of reduced dust absorption, an interaction front, a superimposition created by projection or a region from which radiation reaches the observer more easily. When analysing images, it is therefore necessary to distinguish between the visual and physical centres. The visual centre organises perception; the physical centre organises the process. They sometimes coincide and sometimes do not.

This distinction is particularly important to the hypothesis of the Matrix because the Matrix deals with form but must not forget mechanism. If we observe a bright core and a periphery, we are entitled to speak of the centred morphology of the image. Astrophysical evidence is required, however, before asserting that this core is the source of morphogenesis. The text should therefore employ cautious formulations: ‘may function as a morphological centre’, ‘visually organises the composition’, ‘corresponds to an area of increased brightness’, ‘may be associated with a source of radiation’ or ‘requires clarification of its physical nature’.

A density centre possesses a different meaning. Within dark molecular clouds or star-forming regions, the most important area may be not the brightest, but the densest. It may be concealed from visible light. Such a region may become the site of gravitational compression, protostar formation or further transformation of the cloud’s structure. In this case, the centre is potential, concealed and not yet fully manifest. It is close to A within the A–B–C–D model—not as a seed, but as a region of concentration within which a future process may become possible.

Such a concealed centre is particularly important to the philosophy of the Matrix. It demonstrates that the centre is not always visible. A seed conceals a future form. Stone conceals internal layers. The ocean conceals submarine morphology. Within a nebula, a concealed centre may be

a dense core or a region obscured by dust. In each case, form possesses an internal organisation that may not coincide with the visible surface. Analysis of the centre therefore requires not only observation, but also reconstruction.

An energetic centre may be associated with a star or group of stars acting upon the surrounding cloud. Radiation, stellar winds and outflows create cavities, shells and directional structures. Such a centre need not be located in the middle of the visible cloud. It may be displaced, situated near the edge, concealed by dust or consist of several sources. In this case, the periphery does not form around an ideal point, but under the influence of an actual distribution of energy. The cosmic periphery is therefore frequently asymmetrical.

Asymmetry between centre and periphery is normal in nebulae. The radiality of a flower may be relatively regular, although asymmetries are possible there as well. In a nebula, regularity is frequently disrupted. Some regions expand more rapidly, while others are restrained by a dense medium; one edge is more strongly illuminated, while another is obscured by dust; one outflow lobe is brighter and the other fainter; one direction is open, while another encounters resistance from matter. Cosmic centredness is therefore rarely a matter of perfect geometry. It is a dynamic relationship among forces.

In this sense, the nebula helps refine the concept of the universal invariant. The centre as an invariant does not mean a perfect central point with a symmetrical circumference around it. It means a region that organises a morphological field. The periphery does not mean a regular contour, but an area of transition and response. Interaction occurs between them. This logic may manifest itself in a flower, stone, dome, landscape and nebula, but differently in every case. In a nebula, centre and periphery are especially fluid, distributed and physically heterogeneous.

In nebulae with bipolar structures, the centre may organise an axial rather than circular form. Matter may be ejected in two opposite directions, producing lobes or elongated regions. Such a form may resemble opened petals, wings, an hourglass or bilateral symmetry. Its physical explanation may, however, be connected with rotation, magnetic fields, a binary star, a disc, directional outflows or the distribution of surrounding matter. Here, the centre functions as the node of an axis. The periphery does not develop uniformly in every direction, but along preferred directions.

This axial centredness brings certain nebulae morphologically closer to the logic of a leaf or valley, rather than solely to that of a flower. The midrib of a leaf establishes direction. A valley axis organises relief. In a bipolar nebula, the axis of outflow or expansion may organise two lobes. Yet this remains only a morphological analogy. In one case, the form consists of biological tissue; in another, geological runoff; and in the third, an astrophysical outflow. What they share is the axial organisation of form.

The periphery of a bipolar nebula may be particularly expressive. Its lobes may possess luminous edges, undulating contours, thin shells, internal filaments and ruptures. These edges reveal the interaction between ejected matter and the surrounding environment. They are fronts of the process. As a lobe expands, its edge may become a zone of compression, luminosity or turbulent interaction. The periphery of a nebula therefore does not merely complete the form; it reveals where the process encounters resistance from the cosmic environment.

In supernova remnants, the periphery is frequently a shock front. Expanding matter moves outwards, interacts with the interstellar medium, and creates shells, filaments, arcs and ragged edges. Here, the centre may be the historical site of the explosion, while the periphery is the active

front of expansion. The form of the nebula arises between the past explosion and the present interaction of the shell with its surroundings. This is a particularly powerful example of centre and periphery as a temporal relationship: the centre is connected with a past event, while the periphery is connected with the unfolding present of the process.

In star-forming regions, the periphery may be a site of gas compression caused by radiation and shock fronts. Young stars may blow cavities into the cloud, while matter becomes compressed at the boundaries of these cavities, producing dense edges, pillars, ridges and fronts. In such cases, the periphery may be not merely a diffuse outer margin, but a zone of active future morphogenesis. Where the centre drives matter away, the edge may become the site of new concentration. This demonstrates that the periphery may be productive.

This understanding of the periphery is important to the general model of the Matrix. An edge is not merely the end of a form. In botany, the leaf edge interacts actively with the environment. In geology, the edge of relief is destroyed and provides material for a new cycle. In submarine relief, the edge of a lobe records where a flow ceased and stabilisation began. In a nebula, the edge may be a front of compression, ionisation, dispersal or new star formation. The edge is a zone of transition and potential new development. The periphery may become a new centre.

This is especially important to the transition from D to a new A. The mature visible form of a nebula may contain dense peripheral regions within which stars or new structures may eventually form. The centre may disperse matter, while the edge gathers it. A new cycle then arises not at the centre of the old form, but at its periphery. This logic has already appeared in geology: the destruction of a mountain edge provided sediment for new formations. At the cosmic level, the periphery may likewise become a source of the future. This makes the nebula a complex cyclical system.

The centre and periphery of a nebula may also be connected with the colour of its image. Different colours in astrophotographs frequently correspond to different physical conditions, chemical elements, spectral ranges or methods of data processing. A bright central region may differ in colour from the outer shell; dusty edges may be dark; and ionised gas may glow differently from reflective dust. Colour in an image of a nebula must nevertheless be interpreted cautiously. It may be approximately natural, enhanced, representational or composed from different channels. The chromatic centre of an image therefore does not always correspond to its physical centre. Colour can nevertheless help to differentiate regions morphologically.

Visual analysis of the centre and periphery of nebulae must take projection into account. A nebula is three-dimensional, but its image is two-dimensional. What appears to be a ring may be a shell, torus, spherical structure, bipolar form viewed from a particular angle, or the superimposition of several layers of gas and dust. What appears central may be a nearer or more distant part of the structure along the line of sight. Morphological analysis of images must therefore be accompanied by an awareness of projection. The book need not explore complex astrophysical models in detail, but it must continually acknowledge the limits of visual interpretation.

Nevertheless, an image of a nebula remains valuable material. Even when it is a projection, it records observable morphology. Centredness, peripheral organisation, radiality, shell-like structure, filamentation, rupture and asymmetry may all be identified within it. These features may be used for philosophical-morphological analysis, provided they are not transformed into unsupported causal assertions. The Matrix works with form as a visible or reconstructable organisation, but must respect the object’s physical complexity.

Centre and periphery within nebulae also make it possible to connect the cosmic level with the concept of radiality. Radiality was already important in the flower, seed structure, fruit, succulent, certain stones and submarine domes. In a nebula, radiality may arise around a star, explosion site, centre of expansion, luminous core or dense knot. Cosmic radiality, however, is frequently disrupted by a heterogeneous environment. It therefore rarely produces a perfect circle. It manifests itself instead as a tendency: matter, light or a shell diverges from a region of activity, but encounters different forms of resistance.

This disrupted radiality is particularly important. It demonstrates that the Matrix does not require perfect symmetry. On the contrary, real form frequently arises through interaction between a symmetrical impulse and a heterogeneous environment. Stellar winds may propagate in every direction, but dense clouds, dust, magnetic fields and surrounding matter deform them. The result is an asymmetrical shell, lobes, ruptures and scalloped edges. Cosmic form arises from disrupted symmetry. This corresponds to one of the fundamental ideas of morphogenesis.

The centre of a nebula may be not only a source, but also a void. Some structures contain a cavity blown out by radiation or stellar winds. The centre may then appear not as a bright core, but as an empty space surrounded by a shell. Morphologically, this is highly significant: the centre organises form precisely through the absence of matter. The cavity becomes a centre because the periphery is structured around it. On a different scale, this resembles certain geological and biological forms in which emptiness or a cavity plays a structural role. Physically, however, it involves the evacuation of gas and formation of a shell.

A cavity-centre demonstrates that the centre need not always be dense. It may be an area of low density created by stellar activity. Bright edges, fronts and compressed layers of gas may form around such a cavity. The centre may therefore organise form either as a source of pressure or as the result of material removal. This is an important expansion of the concept of the centre. A centre may be not only a ‘core’, but also a ‘cavity’, if the morphology is organised around it.

At the biological level, a cavity may likewise possess significance: the chamber of a fruit, the hollow interior of a stem, or the centre of a flower as a space in which organs are arranged. At the geological level, it may take the form of a crater, canyon, depression or fault. At the submarine level, it may be a rift, crater or depression. At the cosmic level, it may be a cavity blown into a cloud of gas. In each case, empty space may be morphologically active. This is another example of how the Matrix describes relationships rather than material objects alone.

Nebulae with ring-shaped or shell-like forms demonstrate the relationship among centre, void and edge with particular clarity. A ring may be perceived as a periphery around an empty or luminous centre. Physically, however, it may be a shell, torus, projection of a spherical structure or bipolar form. Ring morphology must therefore be described cautiously. It demonstrates the relationship between centre and shell, but does not always make the three-dimensional structure comprehensible without further analysis. Nevertheless, within the language of the Matrix, a ring nebula is an important example of a form in which the periphery becomes the principal bearer of visible structure.

The periphery of a nebula may possess a scalloped edge. Scallops, waves, indentations, projections, filaments and radiant terminations frequently form where gas and dust interact with radiation, shock waves or the surrounding environment. Morphologically, these edges may resemble serrated leaves, undulating petals, mountain ridges or submarine lobes. Their physical nature, however, is cosmic: gas dynamics, ionisation, turbulence and density differences. The

edges of nebulae will be examined in greater detail in the following section. What matters here is their relationship with the centre: the periphery is frequently a response to central activity.

The centre and periphery of a nebula may also be related to the direction of observation. If a bipolar structure is oriented towards the observer in a particular way, it may appear as a ring or symmetrical shell. Viewed from another orientation, it may appear as two lobes. This once again demonstrates that the morphology of cosmic objects depends not only upon physical structure, but also upon perspective. The book should therefore distinguish between ‘observed morphology’ and ‘possible physical organisation’ rather than conflating them.

Despite these complexities, centre–periphery analysis remains highly productive. It makes it possible to ask appropriate questions of an image of a nebula: Where is the region of maximum brightness? Is a visible source of radiation present? Is there a dense core? Is there a shell? Do structures diverge from a centre? Are there peripheral fronts? Is the form symmetrical? Is the centre displaced? Where is the edge most active? Are there indications of an outflow or cavity? Such questions transform visual admiration of a nebula into morphological investigation.

Within the A–B–C–D model, centre and periphery may be described as stage-related relationships. A is a dense cloud, concealed core, stellar source or area of concentration. B is the onset of an influence: ionisation, outflow, compression, explosion, stellar wind or rupture of a shell. C is the development of the periphery: shells, lobes, filaments, fronts, edges, cavities and radiant structures. D is the observable nebula as a temporarily stabilised centre–periphery form. A new A may arise within dense peripheral regions in which matter gathers once again and initiates a new process. This scheme preserves the general morphological logic, but does not replace an astrophysical model.

It is particularly important that, within a nebula, the centre may generate the periphery and the periphery may generate a new centre. A young star acts upon a cloud, producing a shell and front. Gas may become compressed along that front. New dense cores may emerge within the compressed regions. These cores may become future stars. The centre–periphery relationship then becomes cyclical and distributed. The Matrix manifests itself not as a single point, but as a network of transitions: the centre activates the edge, and the edge becomes a new centre.

This proposition possesses considerable philosophical significance. In the earlier chapters, the seed was both the beginning and the outcome of the biological cycle. In geology, the destruction of form produced new material. In submarine relief, lobes and sediments became a new foundation. Within a nebula, the periphery may become a region of future star formation. At the cosmic level, a new A may therefore arise not necessarily within the old centre, but in peripheral concentrations. The centre migrates, becomes distributed and appears anew.

The nebula also demonstrates that a centre may be multiple. Within extensive star-forming regions, there may be several young stars, several dense cores, multiple sources of radiation and multiple local cavities. The visible nebula then possesses no single centre. It is a polycentric system. This is particularly important to the Matrix: a universal model should not be restricted to monocentric form. Forms with multiple centres exist, in which peripheries overlap, interact and create complex morphology.

The polycentric character of a nebula may manifest itself visually as multiple bright knots, separate lobes, intersecting shells, several dust pillars or several regions of activity. In such a system, the centre–periphery logic persists locally, but becomes networked at the level of the nebula as a whole. Each centre possesses its own sphere of influence, and transitional zones

arise between them. This brings the nebula closer to complex self-organising systems, within which there is no single controlling centre but numerous interacting nodes.

This approach helps prevent excessive symbolisation. A cosmic centre should not be transformed into a mystical centre of the universe. Within a nebula, the centre is a physical or morphological region that organises a particular structure. It may be powerful, beautiful and luminous, but its significance is determined by the process rather than by symbolic dogma. The book must preserve precisely this understanding: the centre as a category of morphogenesis rather than an arbitrary metaphysical sign.

Centre and periphery in nebulae also prepare the way for the section concerning the limits of analogy between a nebula and a flower. A flower possesses a biological centre and a petal-like periphery. A nebula may possess a luminous core and gaseous shell. The visual resemblance may be powerful. A flower, however, is an organism, while a nebula is an astrophysical system. The flower is connected with plant reproduction; the nebula, with interstellar matter, stellar evolution, radiation and gravity. The centre–periphery analogy is therefore admissible only as a morphological invariant, not as an ontological identity.

The illustrations should include images in which centre and periphery are legible without being oversimplified. The first illustration might present a nebula with a bright central source and surrounding shell or lobes (*Fig. 4*). The second might be a diagram of different types of centre within a nebula: luminous centre, density core, source of radiation, centre of expansion, cavity and multiple centres (*Fig. 5*). The third might be a comparative morphological pair, ‘flower — nebula’, identifying only the relationships between centre and periphery without asserting identity (*Fig. 6*). Such images would prepare the way for the later section concerning the limits of analogy.

A diagram demonstrating the difference among the geometric centre, energetic centre and observed luminous centre would be particularly useful. A single image might present a nebula as a cloud in which the bright region is displaced, the dense core is concealed by dust and the centre of expansion lies in another area. Such a diagram would emphasise that the centre in space is not always obvious. It would be methodologically important to the entire chapter.

Thus, centre and periphery within nebulae are not simple geometric elements, but dynamic regions of cosmic morphogenesis. The centre may be a star, dense core, source of radiation, cavity, centre of expansion, axis of outflow or collection of local nodes. The periphery may be a shell, front, cloud edge, compression zone, region of dispersal, filamentary structure or future source of new centres. Their relationship creates the visible morphology of the nebula.

The centre–periphery structure of nebulae may be incorporated into the language of the Matrix only through a rigorous understanding of its astrophysical nature. A nebula may resemble a flower through the relationship among its core, shell, radiant edge and lobate periphery, but it is not a flower. Its centre and periphery form through gas, dust, radiation, gravity, stellar winds, shock waves and environmental heterogeneity. At the cosmic level, the Matrix manifests itself as the dynamic organisation of matter around regions of activity, where the centre creates the periphery, the periphery responds through changes in form, and new centres may arise at the boundaries of the old structure.

15.3. The Edges of Nebulae

The edge of a nebula is one of the most expressive and, at the same time, most complex morphological categories at the cosmic level of the Matrix. In biological forms, the edge is usually associated with the surface of a body: the edge of a leaf, petal, fruit or succulent leaf module. In geology, the edge may be the line of a mountain ridge, a scarp, fault, cliff, valley side or the front of sedimentary spreading. In a nebula, the edge possesses a different nature. It is not a solid boundary. It does not separate a body from its environment in the same way as the shell of a seed or the surface of a stone. The edge of a nebula is a transitional zone within which density, temperature, degree of ionisation, illumination, material composition and the nature of interactions among gas, dust, radiation and the surrounding interstellar medium all change.

The edge of a nebula should therefore not be understood as a contour in the geometric sense. In an image, a nebula may possess a visible silhouette, undulating periphery, luminous shell, dark dusty boundary or radiant projections. Physically, however, this ‘contour’ is often not a line, but a volumetric transitional region. In one zone, gas glows because it is ionised; in another, dust absorbs light; in a third, matter becomes more diffuse; in a fourth, a shock wave compresses the gas; and in a fifth, stellar winds blow out a cavity. The edge of a nebula is therefore not the end of an object, but an active morphogenetic region.

Cosmic clouds frequently possess scalloped, undulating, ruptured and radiant edges. These edges are particularly important to the hypothesis of the Unified Matrix of the Universe because it is precisely at the periphery of a nebula that structural relationships already encountered at other levels are clearly visible: wave, serration, fold, rupture, lobe, ray, edge, front and active boundary. At the cosmic level, however, all these features are astrophysical in nature. They may be associated with turbulence, gas heterogeneity, shock waves, ionisation fronts, interactions between stellar winds and surrounding matter, dust structures, magnetic fields and projection effects.

The scalloped edge of a nebula may be compared morphologically with the undulating edge of a petal or the serrated edge of a leaf. In both cases, the periphery is not a smooth line. It is articulated and possesses projections, recesses, waves, irregularities and rhythmic repetitions. The mechanisms, however, differ. The edge of a leaf forms through tissue growth, venation, cellular differentiation and biological regulatory processes. The edge of a petal is associated with growth, elasticity, opening and the function of the organ. The edge of a nebula forms through gas-dynamic, radiative and plasma processes. Only the morphological invariant of an active, heterogeneous periphery is shared.

The undulating edge of a nebula is particularly important as a sign of non-equilibrium. A smooth boundary would suggest relatively homogeneous interaction between the cloud and its environment. Undulation demonstrates that the interaction is uneven. In some places the gas is denser and in others more diffuse; radiation acts more strongly in some regions and more weakly in others; dust protects matter in one place, while elsewhere a front advances more rapidly; a shock wave passes around a dense knot in one region and compresses it in another. The edge consequently becomes a wave. It records not a state of rest, but differences in velocities, densities and forces.

Such an edge may be understood as the front of a process. The edge of a nebula is frequently the site at which the inner cloud encounters the external environment. If stellar radiation ionises gas, the edge may be an ionisation front. If an expanding shell collides with interstellar matter, the

edge may be a shock front. If a dusty region obscures light, the edge may be a boundary of absorption. If stellar winds blow out a cavity, the edge may be the wall of that cavity. The cosmic edge is therefore not merely a visible line; it is a site of action.

At the terrestrial level, the active edge has already manifested itself as a mountain ridge, rock scarp, fault margin or serrated relief. The active edge of a nebula differs because it is not solid. It does not collapse like rock or erode like a shoreline. It changes through the movement of gas, interactions with radiation, thermal and dynamic processes, compression, dispersal and turbulence. The general logic of the active periphery nevertheless remains: it is the edge that reveals where form encounters an external influence and where that encounter becomes visible morphology.

The radiant edges of nebulae are particularly expressive. They may resemble diverging rays, fibres, jets, threads or elongated gaseous structures. In biology, radiality is associated with the radial arrangement of petals, veins, seed structures or leaf modules. In geology, it may manifest itself in the radial fissures of a dome, lava flows, erosional channels or sediment fans. In space, radiant structures may be associated with directional outflows, the effects of stellar winds, magnetic fields, dust structures, extended filaments or particular patterns of illumination. The radiant edge of a nebula may therefore be compared with radiant and radial forms at other levels only as a morphological motif.

Filaments and threads at the edges of nebulae possess particular significance. They demonstrate that a cosmic cloud may be organised not as a continuous mass, but as a network of slender structures. These threads may be gaseous, dusty, shock-related, magnetically aligned or associated with density heterogeneities. Within an image, they create the impression of fabric, fibres, roots or veins. They are not, however, the tissue of a living organism. They are cosmic filaments arising within a diffuse medium. Morphologically, they resemble the fibres of a leaf or veins within stone, but physically they belong to the interstellar medium.

The ruptured edges of nebulae are particularly important to understanding cosmic morphogenesis as a process of expansion and destruction. If a nebula is a shell ejected by a star or created by a shock wave, its edge may be irregular, discontinuous and broken into fragments, filaments and arcs. Such rupture indicates the heterogeneity of matter and its interaction with the surrounding environment. In some directions the shell may move more rapidly, while in others it encounters resistance; some regions may glow more brightly, while others are obscured by dust; part of the edge may disperse. The cosmic periphery consequently appears damaged, but this ‘damage’ is itself a form of the process.

The ruptured edge of a nebula may be compared with a destroyed mountain ridge or broken edge of stone, but only at the level of the relationship ‘edge as a trace of interaction’. On a mountain ridge, rupture is associated with weathering, rockfalls, glacial action and fracturing within rock. In a nebula, it is associated with gas dynamics, radiation, shock fronts and heterogeneity within the interstellar medium. In both cases, the edge demonstrates that form is not perfectly complete. It is undergoing change. The material nature of that change, however, is different.

The scalloped edges of nebulae are especially reminiscent of the edges of petals and leaves. A scallop is a repeated undulating projection or rounded recess. In a flower, scalloping may form part of the petal’s shape and be associated with growth and tissue differentiation. In a nebula, scalloping may arise where an ionisation front or shock wave moves through heterogeneous matter. Denser regions resist, while less dense regions are destroyed or ionised more rapidly,

causing the edge to become undulating. A similar visual form may therefore result from different types of differentiation: biological in one case and gas-dynamic in the other.

The undulating periphery of a nebula may also be associated with turbulence. Turbulent movement creates vortices, density differences, and folded or wave-like structures. In images, these may appear as cloudy curls, ragged edges, smoky layers, feathers or flames. They resemble water, smoke, fabric, petals or terrestrial clouds. In space, however, they involve the interaction of gas, dust, radiation and magnetic fields within the interstellar medium. The term ‘wave’ should therefore be used cautiously in relation to a nebula: sometimes it refers to a genuine wave or shock structure, while at other times it describes a morphologically undulating contour.

The edge of a nebula may be luminous. This occurs when gas within the peripheral zone is ionised or excited by radiation. A bright rim may indicate a region of active interaction between light and matter. Morphologically, such a rim resembles the illuminated edge of a petal or a mountain ridge highlighted by sunlight. Physically, however, the luminous edge of a nebula may be an ionisation front, shock front or region of enhanced emission. It should therefore be regarded as an energetic boundary rather than an external shell in the materially solid sense.

The edge of a nebula may also be dark. A dark periphery or lane is frequently associated with dust that absorbs light. Visually, such a region creates a sharp contrast and may appear to be a boundary. This boundary may, however, be not the end of the cloud, but a dense dust structure situated in front of or within luminous gas. The dark edge thereby demonstrates that visibility within cosmic morphology depends upon illumination, absorption and projection. An edge may be visible not because matter ends there, but because its capacity to transmit or emit light changes.

This is important to the entire chapter: the edge of a nebula is not only a physical category, but also an observational one. Within an image, we see a boundary of light, colour or contrast. That boundary may correspond to different physical phenomena. The analysis of nebular edges must therefore exercise caution on two levels: first, it must not equate a visible contour with a solid boundary; second, it must not equate visual analogy with terrestrial or biological forms with physical kinship. The cosmic edge requires disciplined interpretation.

Nevertheless, it is precisely the edges of nebulae that provide some of the strongest material for the Matrix. They demonstrate the active periphery in its purest form: without a solid body, biological tissue or geological surface. Here, the edge is a gradient, front, transition and interaction. It demonstrates that form may possess a boundary even when no solid contour is present. This expands the concept of the edge itself. The edge becomes not a line, but a relationship between different states of matter and energy.

In this sense, the nebula helps reconceptualise the edge as a universal invariant. In a leaf, the edge is the boundary of a living surface. In stone, it is the boundary of a solid body or internal layer. In relief, it is a ridge, scarp or fault. On the ocean floor, it is the side of a canyon, a sediment lobe, rupture or dome. In a nebula, the edge is a front of interaction between gas and dust. In every case, the edge is the place at which form becomes most sensitive to its environment. The type of environment and matter, however, changes radically.

The edges of nebulae may also demonstrate natural self-similarity. A large scalloped edge may contain smaller waves; a large dust structure may divide into slender filaments; a single shell may possess secondary arcs; and a single front may contain projections within which still smaller projections are visible. Such nesting may resemble the fractal edges of clouds, coastlines,

mountain ridges or leaf contours. Once again, however, a qualification is required: this may involve multiscale heterogeneity and naturally self-similar morphology rather than a strict mathematical fractal, unless the latter has been specifically demonstrated.

Cosmic edges frequently possess a hierarchical structure. At a large scale, the general shell of a nebula is visible. At an intermediate scale, filaments, arcs and cavities appear. At a smaller scale, dense knots, pillars, threads and dusty projections emerge. This hierarchy is connected with the heterogeneity of the gaseous and dusty medium at different scales. In this respect, the nebula approaches other natural systems: river networks, fractured stone, leaf venation and mountain relief. The physical scale and mechanisms of the cosmic environment nevertheless remain unique.

The so-called pillars, columns and projections at the edges of star-forming regions are particularly interesting. They may arise where dense regions of gas and dust resist destruction by radiation for longer, while less dense matter around them disperses. The result is elongated forms oriented towards the source of radiation or extended along the direction of its influence. Morphologically, they resemble fingers, roots, stalagmites, tongues of flame or the edges of disintegrating fabric. They are, however, forms created through radiative and gas-dynamic interaction. They demonstrate that the edge of a nebula may not only disperse, but also preserve dense remnants.

These dense remnants at the periphery may potentially be productive. In some cases, young stars may be present or form within them. The edge of a nebula then becomes not only a zone of destruction, but also a zone of future formation. This is a highly important motif for the Matrix: the periphery may become a new centre. At the biological level, fruit produced new seeds. At the geological level, a destroyed edge provided sedimentary material. At the cosmic level, a dense edge may become a site of new star formation. These processes are not identical, but the general logic through which the periphery passes into a new beginning is discernible.

The edges of nebulae may also be shell-like. A shell may arise through the expansion of gas from a star, an explosion, stellar winds or other processes. Such a shell may be approximately spherical, ring-shaped, elliptical, ruptured, bipolar or asymmetrical. Within an image, it frequently appears as a bright external boundary. Physically, however, the shell may be a three-dimensional structure visible as a ring because of projection. A shell-like edge of a nebula therefore requires careful description: it may be termed the ‘observed periphery of a shell’, ‘front of expansion’ or ‘luminous boundary of a gaseous structure’.

Shell-like edges are particularly important when making comparisons with flowers. A flower possesses a corolla, petals and a periphery around its centre. A planetary nebula or shell nebula may possess a visually similar composition: centre, gaseous shell, luminous edge and sometimes petal-like lobes. This is precisely where the similarity is most tempting and most dangerous. Section 15.5 will be devoted specifically to the limits of this analogy. It should already be emphasised that the floral appearance of a nebula is a morphological analogy, not a biological meaning.

The cosmic edge is also associated with the direction of radiation. If a source of light or radiation lies within the cloud, the edge may be illuminated from within. If the source lies nearby, the illuminated edge may face towards it. If dust blocks the light, some regions of the edge may be dark. The form of the edge therefore depends not only upon the distribution of matter, but also upon illumination. This distinguishes the nebula from many terrestrial objects whose edges are seen under external lighting. Within a nebula, light is frequently part of the structure itself.

The edge of a nebula may also result from the interaction of several processes. Stellar winds may, for example, create a cavity; radiation may ionise gas along its boundary; dust may form dark projections; turbulence may create undulation; and the dense surrounding medium may restrain expansion in certain directions. The visible edge is then the complex sum of multiple processes. It cannot be explained by a single cause. This makes the cosmic edge particularly important to understanding complex systems.

Within the hypothesis of the Matrix, such an edge may be described as a multiprocess periphery. It contains traces of energy, matter, direction, resistance and time. It does not merely indicate where the nebula 'ends'. It demonstrates how the nebula interacts with the world around it. In this sense, the edge of a nebula performs the same methodological role as the edge of a leaf, mountain ridge or submarine lobe: it is the zone in which internal organisation becomes visible through external interaction.

The edges of nebulae also make it possible to examine the category of resistance. In biology, the edge of a leaf forms through tissue growth and internal regulatory processes. In geology, a mountain edge frequently demonstrates the resistance of rock to destruction. In a nebula, resistance possesses a different character: denser regions of gas and dust may persist for longer under the influence of radiation or a shock front, while more diffuse regions change more rapidly. The edge consequently becomes irregular. Here, resistance is not solid, but density-related, radiative and gas-dynamic. Morphologically, however, it likewise creates projections and recesses.

This is especially apparent in structures where dense dusty knots create shadows or elongated forms. A denser region may protect the matter behind it from radiation, producing a column or dark projection. This phenomenon demonstrates that even within the diffuse cosmic environment, local heterogeneity may organise form. A small difference in density may give rise to conspicuous morphology. This is another example of how form begins with difference.

The edge of a nebula may also be a site of dispersal. Matter at the periphery may gradually enter the interstellar medium, lose density, become less visible and mix with its surroundings. Such an edge is not sharp, but diffuse. Morphologically, it differs from a luminous shell or dark dusty boundary. It demonstrates the disappearance of form. This is important to the Matrix: an edge may be not only a site at which new structure arises, but also a place of dissolution. Form may not terminate at a line, but gradually disappear into its environment.

The diffuse edge of a nebula is particularly important to understanding the boundary as a gradient. In terrestrial forms, the boundary often appears more definite: the edge of a stone, leaf or mountain. Yet even there, the boundary may be complex. In a nebula, the boundary is almost always gradient-based. Density decreases, light scatters, dust becomes less visible and gas passes into the interstellar medium. The edge is a transition rather than a sharp division. This expands the philosophical concept of form: a form may be determinate without possessing a rigid boundary.

The scalloped and undulating edges of nebulae also permit comparison with mountain relief. A serrated mountain ridge arises through the destruction and resistance of material. The scalloped edge of a nebula arises through heterogeneous interaction between gas and radiation. In both cases, the edge is rhythmically articulated. The mountain edge, however, is solid, heavy and gravitational; the cosmic edge is gaseous, luminous and dynamic. This comparison is especially valuable because it demonstrates a single invariant under opposite material conditions.

Comparison with leaves is likewise possible, but requires precise language. A serrated or undulating leaf edge forms part of a living organ. It is connected with veins, growth, water balance, and genetic and physiological organisation. The edge of a nebula possesses neither veins nor tissue. If it displays repeated projections, scallops, waves or radiant terminations, however, it is possible to speak of a morphological similarity between active peripheries. In other words, a leaf and a nebula are comparable not as objects, but as different systems within which the edge becomes a zone of pronounced structural heterogeneity.

Comparison with petals is particularly expressive. An undulating petal and an undulating nebular edge may visually create a similar impression of gentle opening. A petal, however, opens as part of a flower, whereas a nebula expands, glows, disperses or interacts with radiation. The text should therefore avoid assertions such as ‘the nebula opens its petals’. A more precise formulation is permissible: ‘The edges of the nebula may morphologically resemble petal-like undulating peripheries, although their nature is associated with processes involving gas, dust and radiation.’ Such wording preserves both similarity and difference.

The edges of nebulae may also be asymmetrical. Even when the centre of a nebula is active, its periphery may develop differently in different directions. This may result from a heterogeneous environment, varying density, directional flows, magnetic fields, movement of the star or cloud, or interaction with neighbouring structures. The asymmetry of the edge demonstrates that cosmic form is rarely perfect. The Matrix manifests itself not in perfect geometry, but in a real process within which symmetry is continually disrupted.

The disruption of symmetry is one of the principal conditions of expressive form. If a nebula were an entirely homogeneous sphere, its morphology would be impoverished. Heterogeneities, however, create edges, projections, filaments, cavities, lobes and ruptures. It is precisely the disruption of symmetry that makes form legible. This corresponds to the general logic of the study: development begins where a closed whole loses its homogeneity and begins to acquire structure. In space, this occurs through the physical processes of the interstellar medium.

The edge of a nebula may also be a site of contact between several clouds or flows. When different gaseous structures interact, their boundaries may become compressed and curved, forming fronts, arcs and complex contours. In such cases, the edge is not the boundary of a single object, but a meeting zone between several structures. This is particularly important within large star-forming regions, where numerous clouds, stellar winds, cavities and fronts overlap. The edge becomes not singular, but multilayered.

The multilayered character of a cosmic edge may be visually complex. Some elements lie closer to the observer and others farther away; light passes through dust; and different structures overlap in projection. The visible edge may consequently unite several physical levels. This recalls the problem of submarine bathymetry and the section through stone: the image displays a result, but a multilayered reality may lie behind it. Morphological analysis must acknowledge this complexity.

The edges of nebulae may also be associated with colour contrast. Different zones of emission, dust absorption or light scattering may produce different colours. In processed cosmic images, colours may be representational and correspond to different wavelengths or chemical components. A bright edge, red rim, blue shell or dark dust lane should therefore be described not as simple visual decoration, but as a possible indication of physical conditions or a method of visualisation. The book should avoid interpreting colour excessively in the absence of data.

Nevertheless, a chromatic edge possesses morphological significance. It helps reveal differences among regions. It makes the boundary legible. It demonstrates where the state of matter or the character of radiation changes. Even if the colour is representational, it may therefore be useful to morphological analysis. The essential point is to understand that colour within scientific visualisation may be a means of encoding rather than a literal visual experience of the human eye. This must be considered when preparing the illustrations.

The edge of a nebula also helps explain cosmic opening. Section 15.4 will examine opening, rupture and outflow. It may already be stated here that the edge is the place at which opening becomes visible. If a gaseous shell expands, its edge records the front of expansion. If matter is ejected outwards, the edge marks the limit of propagation. If stellar winds have blown out a cavity, the edge reveals the wall of that cavity. If a cloud ruptures, the edge displays the line of rupture. The edge is therefore a record of the direction and limit of cosmic movement.

The edge may also be the place at which movement slows. Expanding matter encounters a denser medium, becomes compressed, begins to glow and forms a front. The edge is then not only the boundary of propagation, but also a zone of deceleration. In this sense, it resembles the front of lava or sediment spreading on the ocean floor: movement ceases and its boundary becomes form. In a nebula, however, this occurs within a medium of gas and dust rather than upon a solid surface. What they share is the relationship: flow — resistance — edge — stabilisation.

The edges of nebulae may be incorporated into the A–B–C–D model as follows. A is the initial cloud of gas and dust, dense region or concealed structure. B is the onset of an influence: stellar radiation, wind, explosion, shock wave, rupture or ionisation. C is the development of the periphery: waves, scallops, rays, filaments, shells, dusty projections and ruptured edges. D is the observed nebula with a temporarily stabilised peripheral structure. A new A may arise within dense regions of the edge, where matter becomes compressed and serves as a source of further development. This scheme is not an astrophysical model, but helps describe morphological dynamics.

It is especially important that the edge of a nebula may become a new centre. Conditions for the further compression of matter may arise within dense peripheral regions. Morphologically, this means that the periphery ceases to be merely the termination of form and becomes a potential beginning. Such a transition was already important in botany, geology and submarine relief. At the cosmic level, it acquires a new meaning: the edge of a cloud may become a region of future star formation or new local activity.

This makes the cosmic edge not only aesthetically expressive, but also ontologically significant to the Matrix. It demonstrates that form does not end at the periphery. It may continue through the periphery into a new process. The edge is a threshold. It separates and connects. It completes and opens. This is especially apparent within a nebula because the boundary of a cloud is not a wall; it is a transitional zone within which matter may disperse, compress, glow, darken or become the source of a new structure.

The illustrations for this section should be selected to demonstrate different types of cosmic edge. The first might present a nebula with a scalloped and undulating periphery, where the edge appears as an active front of interaction (*Fig. 7*). The second might show a nebula with ruptured, radiant or filamentary edges indicating outflow, turbulence or the expansion of matter (*Fig. 8*). The third might be a comparative diagram of active edges: leaf edge, petal edge, mountain ridge, submarine lobe and nebular edge (*Fig. 9*). Such a diagram would connect the cosmic level with the preceding parts of the study.

The comparative diagram is especially important. It should not assert the identity of objects, but demonstrate the shared category of the active periphery. A single sequence might show the edge of a leaf as a biological boundary of growth; the edge of a petal as a soft, opened periphery; a mountain edge as a geological boundary of destruction; a submarine lobe as a hydrogeomorphological spreading front; and the edge of a nebula as a front of interaction between gas and dust. The caption should emphasise the difference among their mechanisms. This would establish the principle of the Matrix both visually and methodologically.

The edges of nebulae also prepare the way for the following section concerning opening, rupture and outflow. The edge is the place where the ejection of matter becomes visible, where expansion acquires a boundary, where rupture creates a new form and where a shell interacts with its environment. The present section may therefore be regarded as a transition from centre–periphery organisation to the dynamics of cosmic opening. The centre establishes activity, the edge records the response, and outflow or expansion connects them within a process.

Thus, within the hypothesis of the Unified Matrix of the Universe, the edges of nebulae may be regarded as a cosmic form of the active periphery. They are not solid contours and are not identical to the edges of leaves, petals or mountain forms. They nevertheless demonstrate similar morphological relationships: undulation, scalloping, rupture, radiality, transition, front, resistance, dispersal and a potential new beginning. Their nature is associated with gas, dust, radiation, shock waves, turbulence, magnetic fields and stellar activity.

The edge of a nebula is not a passive boundary, but an active zone of cosmic morphogenesis. Here, form encounters its environment, energy interacts with matter, light reveals and transforms gas, dust creates dark contours, fronts compress or disperse the cloud, and the periphery may become the site of a new process. At the cosmic level, the Matrix manifests itself through the edge as a dynamic gradient: not a line of completion, but a transitional region within which visible form arises through the interaction of matter, energy and space.

15.4. Opening, Rupture and Ejection

The cosmic form of a nebula manifests itself with particular clarity when it is considered not as an immobile cloud, but as a process involving the opening, rupture and ejection of matter into space. At the preceding levels of the Matrix, opening already possessed different meanings. In biology, it was associated with the unfolding of a leaf, the opening of a bud, the emergence of a petal and the transition of a seed into growth. In geology, opening manifested itself through faulting, the exposure of a layer, the formation of a valley, the destruction of an edge and the revelation of the internal structure of relief. In submarine morphology, opening was associated with the rupture of the ocean floor, the emergence of matter, lobate spreading and the bathymetric revelation of a hidden surface. At the cosmic level, opening acquires another meaning: the expansion of matter through space under the influence of stellar activity, radiation, gravity, shock waves and the internal energy of astrophysical processes.

A nebula may be described as a form arising from the movement of matter. This movement is not always visible as direct displacement because cosmic objects are observed across immense distances and timescales. The morphology of a nebula, however, frequently preserves traces of expansion, ejection, rupture, compression, dispersal, shell expansion, bipolar extension or frontal interaction with the surrounding environment. The visible structure is the result of these

processes. A nebula may therefore be regarded as a cosmic record of movement within which gas, dust, light and energy create form.

Opening within a nebula is not a biological act. A nebula does not open petals, develop from a seed or possess an organ, tissue or programme of growth. It may nevertheless demonstrate the morphological logic of opening: a centre or region of activity produces a directional influence; matter expands or is ejected; a shell, lobe, arc, cavity or front forms around the source; the periphery becomes undulating, radiant or ruptured; and movement gradually stabilises into an observable form. It is this relationship that makes it possible to speak of cosmic opening as a morphogenetic principle without confusing it with biology.

Rupture is one of the principal modes of cosmic opening. In terrestrial forms, rupture may manifest itself as a crack in stone, a fault in a mountain mass, a rift on the ocean floor or a break in the relief. In nebulae, rupture possesses a different character. It may be connected with the disruption of a cloud of gas and dust by stellar winds, a shock wave, radiation, a supernova explosion, the ejection of matter or the interaction of several flows. Rupture in space is not necessarily a crack within a solid body. More frequently, it is a rarefied region, cavity, boundary, breach within a cloud, outflow channel, rupture of a shell or abrupt transition between regions of different density and luminosity.

Cosmic rupture is particularly expressive within nebulae containing dark openings, cavities, broken shells, separated gaseous masses or elongated channels. Such forms demonstrate that the cloud is not homogeneous. Forces may act within it that rupture, hollow out, compress or redistribute matter. Rupture becomes not merely an absence of matter, but a morphological event. It creates a new relationship between centre and periphery, between a dense region and a void, and between luminous gas and dark dust.

Within the A–B–C–D model, rupture frequently corresponds to stage B. Before the rupture, a relatively more enclosed, dense or undivided region may be imagined. The rupture disrupts this integrity. It creates a direction, edge, cavity, channel, front or possibility of ejection. The form then begins to increase in complexity: shells, lobes, filaments, rays, undulating edges and secondary structures appear. Cosmic rupture, like a crack in stone or fault within relief, is therefore a threshold of morphogenesis. It translates hidden stress into visible structure.

Ejection is the second major element of cosmic opening. Within an astrophysical context, ejection may be connected with stellar evolution, a supernova explosion, stellar winds, bipolar jets, the shedding of stellar envelopes, protostellar activity or other processes. Matter leaves the source region, propagates through the surrounding environment, interacts with gas and dust, and creates arcs, shells, lobes, filaments and fronts. Ejection transforms internal energy into spatial form.

Morphologically, ejection may be described as a transition from centre to periphery. Matter or energy is directed outwards, creating a structure that frequently possesses an axis, symmetry, lobes, shells or radiant forms. In this sense, ejection resembles the opening of a flower only at the level of the visual relationship extending from the central region towards the periphery. The mechanism, however, is entirely different. A flower opens through the growth of living tissue; a nebula forms through the movement of gas, dust, plasma, radiation and stellar energy. The expression ‘cosmic flower’ may therefore be used only as a poetic metaphor, not as a scientific description.

Bipolar nebulae provide a particularly powerful example of outflow. Within them, matter may be organised into two opposing lobes or regions diverging from a central source. Visually, such forms may resemble wings, an hourglass, opened petals or a double bowl. Their physical nature may, however, be associated with directional outflows, rotation, a disc, magnetic fields, a binary star or an uneven distribution of the surrounding matter. Morphologically, the important elements are an axis, centre, two peripheries, symmetry and rupture of the shell. Their explanation nevertheless requires an astrophysical approach.

The bipolar structure is particularly important to the Matrix because it demonstrates opening not as uniform expansion in every direction, but as directional unfolding. Form is organised along an axis. The centre becomes a node from which two poles diverge. The periphery does not surround the centre uniformly, but extends in particular directions. This brings certain nebulae morphologically closer not only to flowers, but also to the logic of the leaf, valley and axis, within which form is organised along a principal direction. Once again, however, this is a morphological correspondence rather than a common mechanism.

An expanding shell constitutes another type of cosmic opening. A shell may arise around a star, following an explosion, through the interaction between stellar winds and surrounding gas, or through the ejection of outer stellar layers. It may appear as a ring, bubble, sphere, ellipse, arc or complex ruptured form. Within a two-dimensional image, the shell often resembles a corolla, circle, petal-like edge or luminous rim. Physically, however, it may be a three-dimensional structure viewed in projection. It should therefore be described as a gaseous shell, expansion front or observed ring-shaped morphology.

Shell-like opening differs from petal opening. A petal is an organ whose surface opens from a bud. The gaseous shell of a nebula is an expanding region of matter that is illuminated, ionised or compressed. In both cases, however, the following relationship may be identified: an internal state becomes an external surface. In the flower, this involves tissue; in the nebula, gas and dust. In the flower, opening is connected with a life cycle; in the nebula, with stellar evolution and interstellar dynamics. Here, the Matrix manifests itself as a formal scheme through which the hidden becomes visible, not as a shared biological mechanism.

Supernova remnants provide an example of opening through explosion. A supernova explosion ejects stellar matter into the surrounding space, creating an expanding shell, shock fronts and filaments. Such a form results from an extraordinarily energetic event. The visible edges of a supernova remnant may be ruptured, undulating, radiant, scalloped and filamentary. Here, opening is catastrophic: form arises through the destruction of a star and the propagation of ejected matter.

This is particularly important to the philosophy of the Matrix. Opening is not always a gentle unfolding. It may be explosive, rupturing and catastrophic. Geology has already demonstrated that destruction may generate form. At the cosmic level, this principle acquires a still greater scale. An explosion destroys the previous state of the star, but creates a new structure within the interstellar medium. Destruction becomes morphogenesis. Cosmic form may be born from catastrophe.

Planetary nebulae, by contrast, frequently present an image of more shell-like and symmetrical opening, although physically the process is likewise connected with the late stages of stellar evolution, the ejection of matter and the influence of a hot core. Some possess ring-shaped, lobate, bipolar or complex multilayered forms. Their visual similarity to floral structures may be very strong. It is precisely for this reason that scientific differentiation is necessary. A planetary

nebula is not a flower, but a gaseous shell associated with stellar evolution. Its ‘petals’ are lobes of gas, shells or structures created by projection.

Opening within a nebula may also occur through the excavation of a cavity. Through their radiation and stellar winds, young, massive stars may clear away surrounding gas and create a bubble or cavity. A luminous wall, ionisation front, dense edge or shell forms around that cavity. Morphologically, such a structure resembles an opened void: the centre may be less dense, while the periphery is more pronounced. This is an important type of cosmic form in which the centre is organised through the removal of matter.

Opening through void demonstrates that form may arise not only through the addition of matter, but also through its removal. A cavity becomes a structural centre because an edge forms around it. A similar principle manifested itself in geology through valleys and canyons: the removal of material created form. In space, a cavity blown out within a cloud creates a gaseous shell. This is another example of how the Matrix must encompass not only addition, but also subtraction. The absence of matter may be form-generating.

Rupture and ejection may create a radiant structure. Rays, jets, threads or elongated filaments may diverge from a centre or extend along an axis. They give the form direction. In biology, radiality may be associated with petals, veins or the distribution of seeds. In geology, it may be connected with radial fissures, lava flows or erosional lines. In a nebula, radiality may be associated with outflows, flows of gas, magnetic structures, illuminated dust channels or projection effects. The relationship of direction remains common, but the physical nature differs.

Cosmic ejection may be uneven. If the surrounding environment is heterogeneous, matter propagates more rapidly in some directions and more slowly in others. Dense clouds restrain the front. If an axis of rotation or magnetic structure is present, the outflow may be directional. If the system is binary, the form may become more complex. The opening of a nebula is therefore rarely perfectly symmetrical. It creates asymmetrical lobes, ruptured edges, displaced shells and uneven filaments. The disruption of symmetry makes cosmic form real and morphologically rich.

Asymmetrical opening is particularly important to understanding the nebula as a non-equilibrium system. It demonstrates that form is born not according to an ideal scheme, but within a specific environment. The same energy acting upon heterogeneous matter creates a complex structure. This brings cosmic morphogenesis closer to geological morphogenesis: pressure and erosion likewise act upon heterogeneous material, creating imperfect yet structurally legible forms. The Matrix manifests itself not through absolute geometry, but through stable relationships within variability.

The opening of a nebula may occur in multiple stages. Initially, a dense cloud or stellar system exists. A source of influence then arises: a star, explosion, wind, radiation or gravitational compression. Matter subsequently begins to expand, rupture, glow and become compressed at the edges, forming shells and lobes. The structure then becomes observable as a nebula. Later, it may disperse, give rise to new stars or become part of the interstellar medium. This staged development may be related provisionally to A–B–C–D, provided it is remembered that this concerns cosmic physics rather than biological life.

Within such a scheme, A is the initial cloud, shell, star or dense region. B is rupture, ejection, the onset of expansion, ionisation, a shock wave or stellar wind. C is the development of structure: shells, lobes, filaments, fronts, cavities, rays and ruptured edges. D is the observed nebula as a temporarily stabilised form of a process. A new A may arise within dense, compressed regions

where matter once again becomes the source of new star formation, or within the redistributed interstellar medium from which new structures may subsequently form. This scheme is morphological rather than a complete astrophysical model.

It is particularly important to emphasise the temporary nature of stage D. The observed nebula appears complete because an image captures its form. Physically, however, it continues to change. Its shell expands, filaments disperse, gas cools or heats, dust is redistributed, stellar radiation changes and dense regions may contract. D in space is not an end, but a visible moment within a prolonged process. A nebula as form is therefore always temporary.

The opening of a nebula is also connected with observation. We see a nebula because light has travelled through cosmic space and been recorded by instruments. Images are frequently created from data collected in different regions of the spectrum: visible, infrared, ultraviolet, X-ray or radio. Cosmic opening therefore possesses two dimensions. The first is physical: matter actually expands, is ejected, emits light and interacts. The second is observational: human beings obtain an image through telescopes, data processing and visualisation. As with the ocean floor, a dual opening exists here: natural and epistemic.

This must be taken into account when analysing images. What appears to be a bright ejection may have been emphasised through a particular spectral channel. What resembles a petal may result from the projection of a three-dimensional structure. What is perceived as a rupture may be a dark dust lane in the foreground. Cosmic opening therefore requires caution. Morphological analysis may refer to visible lobation, radiality, rupture or shell-like organisation, but the physical explanation should be formulated provisionally in the absence of specialised data.

Such caution does not, however, diminish the significance of form. Images of nebulae genuinely display complex morphological relationships. They constitute scientifically obtained visual data or processed representations of such data. They make it possible to observe the centre, edge, ejection, shell, dust structure, filaments, lobes and ruptures. What matters to the Matrix is precisely that cosmic form may be incorporated into the general language of morphogenesis when the levels are rigorously distinguished: visual image, morphological invariant and physical mechanism.

Opening, rupture and ejection within nebulae may be compared with the submarine forms of the preceding chapter. A submarine rupture exposed the surface of the ocean floor; lava or sediment spread to form lobes; and the stabilised surface recorded movement. Within a nebula, rupture of a cloud or shell, the ejection of gas, the expansion of matter and the formation of a periphery create an analogous morphological sequence: threshold — movement — field — edge — stabilisation. The material and physical conditions, however, differ. Water and rock are replaced by gas, dust, plasma, radiation and gravity.

Cosmic opening may likewise be compared with mountain relief. A fault within a mountain created an edge and valley; an explosion or stellar wind creates a cavity and shell. A mountain slope exposed internal layers; a nebula reveals structures of gas and dust through light and rarefaction. A mountain edge was destroyed and provided material for a new cycle; the edge of a nebula may compress matter and become a site of new star formation. What they share is the processual nature of form, while their mechanisms are entirely different.

The analogy with biological opening is the most visually powerful and the most methodologically dangerous. The bud and flower provide human beings with a familiar image of opening: centre, petals, periphery, colour and symmetry. A nebula sometimes resembles an opened flower,

particularly if it possesses a central star, lobes, shell and luminous edges. This resemblance, however, must not lead to assertions that a nebula ‘grows like a flower’ or ‘is a cosmic flower’. It is permissible to speak only of the morphological invariant of opening: centre, initial state, expansion, periphery, edge and disruption of symmetry.

The following section will therefore be devoted to the limits of the analogy between a nebula and a flower. The central principle must already be established: cosmic opening is a physical process involving the expansion and redistribution of matter, not the biological opening of an organ. If this distinction is maintained, the analogy becomes productive. It makes it possible to identify shared forms: lobe, shell, edge, centre, rupture and ejection. If the distinction is forgotten, the analogy becomes a mystification.

Cosmic opening is also connected with the concept of the shell as something formerly internal. Within a planetary nebula, the ejected envelope of a star becomes an external visible structure. Within a supernova remnant, the internal matter of a star may be ejected outwards. Within a star-forming region, internal cavities may be blown out by stellar winds. In all these cases, that which was associated with the internal state of a system becomes external form. This is a highly important morphological relationship: the internal becomes the periphery.

In biology, a similar relationship manifested itself in the petal as a former layer of the bud. In geology, an internal layer became an exposure on a slope. On the ocean floor, internal energy or matter became a dome, lava field or lobe. Within a nebula, a stellar envelope or internal gaseous state becomes an external luminous form. The mechanisms differ, but the relationship ‘formerly internal — visible periphery’ is a powerful invariant of the Matrix.

Rupture may also be interpreted as the creation of a visible edge. While a cloud remains relatively continuous, its boundary may be diffuse. When a cavity, channel, outflow or ruptured shell arises, edges appear. These edges become morphologically expressive: they glow, darken, undulate, elongate and divide into filaments. Rupture thereby not only disrupts form, but also creates new visibility. Just as a crack in stone made its internal structure legible, a rupture within a nebula makes the dynamics of the cloud visible.

Ejection creates direction. It demonstrates where matter is moving, where the axis lies, how energy is distributed and where the periphery arises. The directionality of an ejection may be radial, bipolar, jet-like, asymmetrical or shell-like. In each case, form is organised not only spatially, but also dynamically. It possesses a vector. Cosmic morphogenesis therefore cannot be described solely through contours. The direction of the movement of matter and energy must also be considered.

The opening of a nebula is frequently accompanied by the formation of cavities. A cavity is an important morphological form because it reveals a space cleared or rarefied by a process. Walls, luminous edges, dense fronts and dust pillars may form around a cavity. A cavity is a form of absence, yet it organises the matter present around it. This brings the nebula closer to certain geological forms in which the emptiness of a valley or canyon organises the relief. In space, a void may likewise be an active structural element.

Cosmic ejection may also create filaments. Matter stretched, compressed or illuminated along particular directions forms threads. These may be exceptionally slender and complex, creating the impression of fibres. Filamentation is one of the most important features of cosmic morphology. It demonstrates that matter is not distributed evenly, but becomes gathered into extended structures. Such filaments may be the edges of shells, traces of shock waves, dust

structures or dense channels. Morphologically, they resemble veins, roots, fibres and cracks, but physically they are structures of gas and dust.

The process of dispersal is also important to the opening of a nebula. Following ejection or expansion, matter may gradually dissolve into the interstellar medium. Edges become diffuse, brightness diminishes and the structure loses contrast. Opening does not necessarily lead to a stable form. It may culminate in the disappearance of the form as a separate object. This is important to the Matrix: D is not necessarily stable for an extended period. In space, a visible structure may be a transitional state between a dense cloud and dispersed matter.

Dispersal does not, however, mean that matter ceases to exist. It continues to exist within the interstellar medium, may become incorporated into new clouds, be compressed by new waves, or become part of future stars and planetary systems. In this sense, cosmic D may pass into a new A through the redistribution of matter. The form disappears, but the material retains the potential for new becoming. This corresponds to the general cyclical logic of the Matrix: a completed form becomes the source of a new process.

Opening, rupture and ejection also demonstrate that cosmic form may be event-based. Some nebulae are connected with an event: an explosion, the ejection of an envelope, the onset of stellar activity or a shock wave. The event creates a structure that may persist far longer than the event itself. An explosion is brief, but its remnant may remain visible for a long time. An ejection may be episodic, but its lobes persist. Stellar winds may act over an extended period and create a cavity. Cosmic form is frequently the temporally extended trace of an event.

This brings nebulae closer to stone as ‘frozen time’, although on an entirely different level. Stone recorded pressure, layer, fissure and vein. A nebula records ejection, expansion, ionisation, a shock wave and the interaction of gas and dust. Stone was a solid archive; the nebula is a luminous and gaseous archive. In both cases, visible form contains the history of a process. The materiality of that history, however, differs.

The opening of a nebula may also be understood as the formation of a visible periphery from invisible dynamics. Before ionisation, gas may be invisible within a particular spectral range. Once affected by radiation, it begins to glow. Before ejection, matter may form part of a star or dense cloud. After ejection, it becomes a shell. Before rupture, a cloud may be dark and dense. Following rupture, luminous contrasts and edges appear. Cosmic form arises not only from matter, but also from the conditions of its visibility.

This is especially important to astrophotographic images. The beauty of a nebula is frequently connected with the way different physical states of matter become visible through different colours, levels of luminosity and contrasts. Such images must nevertheless be interpreted as scientifically mediated. Colour, brightness and structure may depend upon spectral range, filters, processing, exposure and the combination of data. Morphological opening within an image of a nebula is therefore simultaneously physical and visualisational. The nebula opens in space and is revealed through observation.

The illustrations for this section should demonstrate three types of cosmic opening. The first might present a nebula with pronounced shells or lobes, revealing the expansion of matter from centre to periphery (*Fig. 10*). The second might show a structure containing a rupture, cavity or ejection, within which the cosmic cloud appears to have been disrupted by internal energy (*Fig. 11*). The third might be a diagram of ‘rupture — ejection — expansion — shell — periphery’,

demonstrating the morphological sequence of cosmic opening (*Fig. 12*). These images would connect the dynamics of the nebula with the general model of the Matrix.

A diagram in which the centre of activity, rupture of the shell, direction of ejection, expanding lobe and active edge are presented as parts of a single process would be particularly important. Such a diagram should not be overloaded with physical details, but should clearly demonstrate the morphogenetic logic: internal stress creates a threshold; the threshold releases movement; movement forms a surface or shell; and the edge records interaction with the surrounding environment. This would provide a visual expression of cosmic opening.

Opening, rupture and ejection also help explain why a nebula may appear simultaneously fragile and powerful. It resembles a slender cloud, gentle glow or translucent fabric, yet behind this form lie immense energies, masses and distances. Cosmic form combines visual lightness with physical power. This distinguishes nebulae from stone and mountains, in which the weight of form is apparent. Within a nebula, force is concealed behind light and cloud-like structure. Morphogenetically, however, it is no less significant.

Thus, the nebula as a cosmic form may be described through opening, rupture and ejection as its principal dynamic motifs. Opening demonstrates the transition from a hidden state to a visible structure. Rupture demonstrates the threshold at which a cloud, shell or medium loses homogeneity and creates a new edge. Ejection demonstrates the directional propagation of matter and energy through space. Together, they form shells, lobes, filaments, cavities, rays, undulating edges and ruptured peripheries.

Cosmic form is not a static figure. A nebula is a process involving the expansion, ejection, rupture, compression, dispersal and stabilisation of matter within the interstellar medium. It may morphologically resemble an opened flower, petal, lobe, wave or shell, but its nature is connected with astrophysical processes. At the cosmic level, the Matrix manifests itself as the dynamics of transition: the hidden becomes manifest, the centre generates the periphery, rupture creates an edge, ejection forms a lobe, and the movement of matter becomes an observable form.

15.5. The Nebula and the Flower: The Limits of Analogy

The comparison between a nebula and a flower is one of the most expressive, yet also one of the most hazardous, comparisons within the hypothesis of the Unified Matrix of the Universe. Visually, certain nebulae may indeed resemble flowers: a luminous centre, diverging lobes, a glowing shell, undulating edges, a radiant periphery, transitions of colour and an impression of opening. The human eye readily recognises a familiar biological form within a cosmic cloud. It is precisely for this reason, however, that such a comparison requires particular rigour. A nebula and a flower are not the same object, do not belong to the same level of matter and do not form through the same mechanism.

A flower is an organ of a living plant. Its form arises through biological morphogenesis: cell division, tissue growth, genetic regulation, hormonal processes, mechanical stresses, organ differentiation, interaction with the environment and incorporation into the plant's reproductive cycle. The petals of a flower possess tissue structure, vascular elements, a surface, edge, colour, function and place within the organism's life cycle. A flower opens as part of a living system

associated with reproduction, interaction with pollinators, protection of reproductive structures and the biological strategy of the species.

A nebula is an astrophysical structure. Its form arises from gas, dust, plasma, radiation, gravity, turbulence, magnetic fields, stellar winds, shock waves, the ejection of matter, ionisation, cooling, compression and expansion. It possesses no cells, tissues, genes, organs, physiology, biological function or plant life cycle. If a nebula possesses lobes, shells or radiant edges, these are not petals in the biological sense. They are gaseous, dusty, plasmatic, luminous or projective structures associated with cosmic dynamics.

The analogy between a nebula and a flower is therefore permissible only at the level of morphological invariants. This means that the objects themselves should not be compared as though they were identical; only particular structural relationships may be compared: centre and periphery, radiality, opening, lobation, an undulating edge, scalloping, radiant structure, shell-like organisation, layer, rupture, asymmetry, the transition from hidden to manifest and the distribution of matter around a region of activity. It cannot be asserted, however, that a nebula 'is a flower', 'grows like a flower' or 'obeys the biological code of a flower'. Such claims would constitute a methodological error.

The boundary of the analogy lies between form and mechanism. The form may be similar, while the mechanism may be entirely different. A flower opens its petals through the growth and differentiation of living tissue. A nebula forms lobes or shells through the expansion of gas, the ejection of matter, the effects of radiation, stellar winds, a shock wave or interaction with the interstellar medium. The visual result may contain a similar relationship of 'centre — diverging periphery', but the origins of that relationship differ. This distinction must be maintained throughout the text.

Philosophically, this differentiation does not weaken the hypothesis of the Matrix, but makes it more rigorous. If the hypothesis asserted the literal identity of flower and nebula, it would be vulnerable to criticism as a poetic or mystical analogy. If, however, it proposes that certain morphological relationships may recur within different material systems, the comparison becomes scientifically and philosophically productive. In this case, the Matrix is understood not as a single physical mechanism governing every form, but as a metatheoretical language for describing recurrent principles of organisation.

A flower and nebula may be compared through the centre. The centre of a flower is associated with its reproductive structures, floral axis and the point at which the petals, stamens, pistil and receptacle are joined. It is part of a living organ. The centre of a nebula may be a star, group of stars, dense core, source of radiation, centre of expansion, cavity, region of ejection or visual maximum of brightness. The centres of a flower and nebula belong to different realities. Morphologically, however, both may organise a periphery. It is therefore permissible to speak of a centre–periphery analogy, but not of an identity between centres.

A flower and nebula may be compared through the periphery. In a flower, the periphery is expressed through its petals and their edges. It possesses tissue structure, colour, form and biological function. In a nebula, the periphery is expressed through a gaseous shell, luminous edge, dust boundary, filaments, shock front or undulating region of interaction with the interstellar medium. Both peripheries may be undulating, radiant or lobate. In one case, however, the periphery consists of living tissue; in the other, it is a dynamic zone of gas and dust. The analogy is therefore limited to the formal relationship of the 'active edge', not a common nature of the edge.

A flower and nebula may be compared through opening. A bud opens, its petals diverge and a concealed structure becomes visible. A nebula may demonstrate the expansion of a shell, the ejection of matter, the excavation of a cavity, the rupture of a cloud, the dispersal of gas and the formation of lobes and filaments. In both cases, there is a transition from a more concealed or concentrated state towards a more open and spatially extended form. Biological opening and astrophysical expansion are not, however, the same process. Only the morphological scheme of transition is shared: hidden state — threshold — unfolding — periphery — edge.

A flower and nebula may be compared through lobation. A petal is an organ of a flower. A nebular lobe may be a gaseous or dusty region, shell, jet, bipolar outflow, fragment of an expanding structure or result of visual projection. Externally, they may resemble one another: a broad form, narrowing at the base, expansion towards the periphery and an undulating edge. A petal, however, possesses biological tissue and function, while a cosmic lobe possesses astrophysical dynamics. The text should therefore refer not to the ‘petals of a nebula’, but to ‘petal-like lobes’, ‘morphologically petaloid regions’ or ‘lobate gaseous structures’.

A flower and nebula may be compared through colour, but here the risk of error is particularly great. A flower possesses the actual colouration of tissues associated with pigments, reflection of light, biological function and the perception of pollinators. The colour of a nebula within an image may be connected with the emission of different gases, dust, scattering, temperature, spectral range, filters, data processing and representational colour coding. The resemblance between the colours of a nebula and flower should therefore not be interpreted as evidence of a profound structural relationship. Colour within a nebular image is frequently a scientific visualisation of physical conditions rather than biological colouration.

This is particularly important when working with images of space. Many images of nebulae are created from observations in different spectral ranges and may employ enhanced or representational colours. They are magnificent and scientifically valuable, but they do not constitute a simple ‘view through the eyes’. If a nebula appears as a red, blue or golden flower, this may result from physical emission, scattering by dust and data processing. The book must indicate that the visual image of a nebula is scientifically mediated. The analogy with a flower must take this fact into account.

A flower and nebula may be compared through radiality. In a flower, radiality is associated with the arrangement of organs around an axis. In a nebula, it may be associated with the expansion of a shell, the influence of a central star, the ejection of matter, a field of illumination or the geometry of projection. The radial form may be similar, but its meaning differs. Floral radiality forms part of the plant’s biological architecture. Cosmic radiality results from the energetic or dynamic distribution of matter. Radiality may therefore be regarded as a morphological invariant, but not as evidence of a common genesis.

A flower and nebula may be compared through the edge. The edge of a petal may be undulating, scalloped, serrated or smooth. The edge of a nebula may be scalloped, undulating, ruptured, filamentary or radiant. In both cases, the edge is a region of expressive morphology. The edge of a petal, however, forms through tissue growth and the mechanics of a living organ; the edge of a nebula forms through interactions between gas and dust, radiation, shock waves, turbulence and environmental heterogeneity. Only the concept of the active periphery is shared. The mechanism of the edge differs.

The limits of analogy are particularly apparent in the example of the edge. Visually, the scalloped edge of a nebula may possess almost the same compositional logic as the undulating edge of a

petal. If a researcher concludes that they are physically identical, however, an error has been made. If the researcher instead states that both forms demonstrate the invariant of an active, rhythmically articulated periphery, the comparison remains within the limits of a valid morphological analogy. The entire chapter must therefore continually distinguish between ‘resembles’ and ‘is the same as’.

Flower and nebula also differ in scale. A flower is an object on biological and human scales. It may be seen, touched, dissected, examined under a microscope and observed throughout its development. A nebula is an object on a cosmic scale. Its dimensions may be measured in light-years. It is observed through telescopes, spectral data, image processing and models. Human beings do not perceive a nebula directly within its actual volume. The analogy between flower and nebula therefore connects forms separated by immense differences in scale, time and modes of observation.

This difference in scale does not make analogy impossible, but gives it a distinctive character. The Matrix as a metamorphological language seeks precisely to investigate the recurrence of relationships across different scales. Scale cannot, however, be ignored. What constitutes a millimetre-scale curvature of tissue within a flower may constitute a light-year-scale structure of gas within a nebula. What occurs over hours or days in a flower may unfold over millennia in space. Similarity of contour must therefore not conceal differences in space and time.

A flower and nebula also differ temporally. A flower develops within the plant’s life cycle. Its opening may be observed in the real time of human experience. A nebula develops over cosmic timescales, while its image presents the object as it existed when the light now reaching the observer was emitted. A nebula is therefore given to us as a visible past. Its form is historical in a physical sense. A flower likewise possesses a history of growth, but this belongs to an entirely different temporal regime.

A flower and nebula differ in their types of stability. A flower is a short-lived biological form, but its structure is regulated by the organism. A nebula may exist for an exceptionally long time on the human scale, yet physically it is a non-equilibrium structure undergoing dispersal or transformation. It does not maintain its form through a living organism. Its stability is relative and determined by the balance among gas-dynamic, gravitational, radiative and other processes. The ‘form’ of a nebula is therefore more fluid and distributed than that of a flower.

A flower and nebula differ in the types of matter of which they consist. A flower consists of living cells, tissues, water, organic compounds, pigments and vascular structures. A nebula consists of gas, dust, ionised matter, plasma, molecular clouds, atomic and molecular components, radiation and fields. The form of a flower possesses the material density of a living body. The form of a nebula may be extraordinarily diffuse. It is visible through light, emission, scattering and contrast. A nebula is therefore a form of distributed matter rather than a dense body.

This difference in matter is particularly important to the concept of the edge. The edge of a flower may be located as the physical boundary of tissue. The edge of a nebula is frequently a gradient of density, light, temperature or ionisation. When speaking of the ‘edge of a nebula’, the term is therefore being used in an expanded sense. This is not the edge of an object, but a transitional zone. The distinction must be stated clearly so that the analogy with a petal does not create a false impression of a solid cosmic contour.

A flower and nebula differ in their types of function. A flower possesses a biological function within the plant system. It is associated with reproduction, the attraction of pollinators, the

protection of reproductive organs and the production of seeds. A nebula has no function in the biological sense. It may be associated with star formation, stellar evolution, enrichment of the interstellar medium and redistribution of matter, but this is not function in the sense of an organ within a living organism. One should therefore not speak of the ‘purpose’ of a nebula in the same way as the function of a flower. It is possible instead to speak of the role of a nebula within astrophysical processes.

A flower and nebula also differ in their types of organisation. A flower is part of an organism and is incorporated into the hierarchy of a plant. A nebula is part of the interstellar medium and is connected with larger galactic processes. A flower possesses internal biological regulation. A nebula possesses no single controlling centre. Even where a central star is present, it does not regulate the nebula as an organism regulates an organ. It acts physically through radiation, stellar winds, gravity and outflows. The centre of a nebula is therefore not an ‘organising intelligence’ or ‘biological centre’, but a physical node of processes.

All this demonstrates that the analogy between a nebula and a flower must possess several stages. The first level consists of visual association: the nebula resembles a flower. This level is natural, but insufficient. The second level consists of morphological description: centre, periphery, lobes, edges, radiality and opening. This level is already analytical. The third consists of distinguishing mechanisms: the biology of the flower and the astrophysics of the nebula. The fourth consists of philosophical generalisation: different systems may demonstrate similar relationships of form while possessing different material foundations. Only the fourth level corresponds fully to the purpose of the study.

If the comparison stops at the first level, the analogy remains superficial. If it proceeds to the second, it becomes useful. If the third is added, it becomes scientifically valid. If it culminates in the fourth, it enters the hypothesis of the Matrix as part of a metamorphological language. The section concerning the limits of analogy is therefore necessary not in order to reject the comparison, but to cleanse it of crude and erroneous interpretations.

The central principle may be formulated as follows: a nebula and a flower cannot be identified ontologically, but may be compared morphologically. Ontological identification would assert that they are the same type of object or manifestations of the same mechanism. Morphological comparison asserts that similar structural relationships may be observed within both objects. This distinction is central to the entire study. The hypothesis of the Matrix operates precisely at the level of morphological relationships, not at the level of literally conflating objects.

The second principle may be formulated as follows: the analogy must be verifiable through features. It is insufficient simply to say that ‘the nebula resembles a flower’. It is necessary to specify precisely what is similar: the central region, radial structure, lobate periphery, scalloped edge, shell-like organisation, radiant structure, asymmetrical opening or transition from centre to edge. The more precisely the features are identified, the stronger the analogy becomes. The more general and emotional the comparison remains, the weaker its scientific value.

The third principle is that every feature must be related to its own mechanism. If centres are compared, it must be stated that the flower possesses a biological centre, while the nebular centre is luminous, density-based, energetic or dynamic. If edges are compared, it must be stated that the flower’s edge consists of tissue, while the nebular edge is formed through gas, dust and radiation. If opening is compared, it must be stated that the flower opens through growth, while the nebula expands, ejects matter or becomes illuminated. Such an approach disciplines the analogy.

The fourth principle is that the image is not identical to the object. This is particularly important in the case of nebulae. A flower may be photographed in ordinary visible light, although even then the photograph represents a choice of angle and illumination. A nebula, however, is frequently represented through complex astrophysical visualisation. Colours may be representational, observational ranges may differ, contrast may be enhanced and the structure may be affected by projection. We must therefore understand that we are comparing an image of a nebula with an image or visible morphology of a flower, rather than simply comparing 'object with object'. This level of mediation must not be forgotten.

The fifth principle is that an analogy does not constitute proof of the hypothesis, although it may provide material for its development. The resemblance between a nebula and flower does not in itself prove the existence of the Unified Matrix of the Universe. It may serve as a basis for asking which invariants of form recur within different systems. If those invariants are subsequently described, classified, compared and limited according to their mechanisms, the analogy becomes research material. Images of nebulae should therefore be used as elements of morphological analysis rather than as visual evidence.

This is particularly important to the credibility of the book. A scientifically trained reader may respond critically to direct assertions about 'cosmic flowers'. If, however, the text honestly acknowledges the limits of analogy, distinguishes levels and makes no impossible claims, it becomes considerably more persuasive. The scientific-philosophical strength of the hypothesis lies not in declaring everything to be the same, but in demonstrating the recurrence of structural relationships while preserving differences among mechanisms.

The nebula and flower may be considered through the A–B–C–D model, although here too limitations are necessary. In a flower, A may be the bud; B, the onset of opening; C, the unfolding of petals and increasing structural complexity; and D, the fully opened flower, followed by a new cycle through fruit and seed. In a nebula, A may be a dense cloud, star, shell or concealed region of activity; B, ejection, ionisation, rupture, explosion or stellar wind; C, the development of shells, lobes, filaments and edges; and D, the observable nebula as a temporarily stabilised form. Biological and cosmic stages are not, however, identical. Here, the model is a language of relationships rather than a universal physical scenario.

It is particularly important to distinguish between the 'seed' and the 'star'. In certain metaphorical descriptions, the central star of a nebula may resemble the seed of a cosmic flower. This is a dangerous oversimplification. A seed is a biological structure containing an embryo and the potential cycle of a plant. A star is an astrophysical object and a source of radiation, energy, gravity and evolutionary processes. They may be compared only as centres around which form is organised; they cannot be identified. A star is not the seed of a nebula in a biological sense.

It is likewise necessary to distinguish between the 'petal' and the 'lobe'. A petal is an organ of a flower. A nebular lobe is a region of gaseous and dusty structure. To avoid conflation, the text should use expressions such as 'petal-like lobe', 'lobate structure' or 'a periphery morphologically resembling a petal'. Such terminology preserves the analogy while preventing the biologisation of space. It should become the standard throughout the chapter.

It is necessary to distinguish between 'opening' and 'expansion'. A flower opens biologically. A nebula expands, disperses, ejects matter or forms a shell. The word 'opening' may be used in relation to a nebula as a morphological metaphor, but it should be accompanied by a physical clarification: the expansion of a gaseous shell, the ejection of matter, the rupture of a cloud, the

excavation of a cavity, ionisation or the propagation of a shock wave. The term ‘opening’ will then not mislead the reader.

It is necessary to distinguish between an ‘edge’ and a ‘front’. The edge of a petal is the boundary of tissue. The edge of a nebula is frequently an ionisation front, shock front, dust boundary, density gradient or luminous contrast. When describing nebulae, it is therefore useful to speak of an ‘observed edge’, ‘gas-and-dust front’, ‘peripheral region’, ‘luminous shell’ or ‘transitional zone’. These formulations are more precise than the word ‘edge’ alone, although the latter may still be used as a morphological category.

It is necessary to distinguish between ‘symmetry’ and ‘projection’. A flower may be examined in three-dimensional space and its radial or bilateral symmetry observed. A nebula is frequently seen in projection. What appears symmetrical may result from the angle of observation. What appears as a ring may be a shell or torus. What appears to be petals may be a bipolar structure viewed from a particular angle. Morphological analysis of a nebula must therefore take account of the fact that an image is a two-dimensional representation of a three-dimensional structure.

The limit of analogy is also connected with the absence of biological purpose in a nebula. A flower participates in the life cycle of a plant. A nebula possesses no purpose established by an organism. It may participate in star formation, the redistribution of matter and the chemical enrichment of the interstellar medium, but these processes do not constitute purposive activity. It is therefore inappropriate to say that a nebula ‘strives’ to open or ‘creates’ form in the biological sense. It is more accurate to say that processes lead to the formation of an observable structure.

This distinction is particularly important to philosophical language. Metaphors of ‘striving’, ‘opening’, ‘birth’ and ‘flowering’ may be expressive, but in a scientific-philosophical book they must be accompanied by clear qualifications. Otherwise, there is a risk of teleologising the cosmos—attributing goals and intentions to it that the analysis has not demonstrated. The hypothesis of the Matrix must be a language of form rather than a language that unjustifiably animates the world.

Metaphors cannot, however, be abandoned entirely. Without metaphor, it is impossible to connect different levels of perception and thought. Comparing a nebula with a flower helps reveal a form that might otherwise be perceived only as an abstract cloud. Metaphor provides an entry into analysis. It must, however, remain controlled. A good metaphor reveals structure; a poor metaphor replaces it. Within this book, the comparison between nebula and flower should function as a good metaphor: it helps reveal centre, periphery, opening, edge, lobe and asymmetry, but does not supersede astrophysics.

The limits of analogy also mean that not every nebula should be compared with a flower. Some nebulae possess chaotic, fibrous, diffuse, elongated, filamentary or irregular forms for which a floral analogy would be artificial. In such cases, it is better to employ other morphological categories: cloud, fibre, shell, front, cavity, thread, arc, remnant or outflow. The analogy must arise from the object rather than being imposed upon it in advance. This is an important rule of morphological analysis.

Nor is every flower suitable for comparison with a nebula. Flowers exhibit an immense diversity of forms: radial, bilaterally symmetrical, tubular, compound, small, large, simple, double and asymmetrical. If a specific nebula is compared with a flower, a morphologically relevant pair should be selected: for example, a radial nebula with a radial flower; a bipolar nebula with a

flower or petal-like form possessing axial symmetry; or a scalloped nebular edge with an undulating petal. Otherwise, the comparison will be arbitrary.

Visual pairs should be constructed according to the principle of structural correspondence. In a ‘nebula — flower’ pair, the specific elements being compared should be clearly visible: centre, periphery, lobes, edge, radiality, axis and shell. If these elements are not legible, the pair will be decorative. If they are legible, the pair becomes analytical. The illustrations for Section 15.5 should therefore be not merely beautiful, but methodological. They should demonstrate both the resemblance and its limits.

A diagram presenting three levels of analogy would be especially useful. The first level would be visual resemblance: the nebula resembles a flower. The second would consist of morphological invariants: centre, periphery, lobes, edge and opening. The third would present the difference between mechanisms: biological growth and astrophysical dynamics. Such a diagram would enable the reader to understand how the comparative images should be interpreted. It would serve as a methodological key to the cosmic part of the study.

A comparative table or diagram without excessive text might also be proposed. One column would present the flower: cells, tissue, petals, biological centre, growth, function, pollination and seed. The other would present the nebula: gas, dust, shells, star or dense core, radiation, ejection, stellar evolution and the interstellar medium. Between them would appear the shared morphological relationships: centre, periphery, edge, opening, lobation, radiality and asymmetry. Such a diagram would demonstrate especially clearly where the analogy is permissible and where it ends.

The study should use consistent formulations that prevent error. These might include: ‘morphologically resembles’, ‘visually comparable’, ‘demonstrates a similar invariant’, ‘may be considered analogous at the level of form’, ‘while the physical mechanisms remain entirely different’ and ‘without identifying biological and astrophysical processes’. These formulations should appear regularly throughout the cosmic chapters. They create methodological discipline.

Excessively strong formulations should likewise be avoided: ‘nebulae prove the floral structure of the cosmos’, ‘the flower and nebula are the same form’, ‘the cosmos grows like a plant’, ‘stars open petals’ or ‘a nebula is a living flower’. Such expressions may be employed as poetic images outside scientific argument, but they are undesirable within the present book because they blur the boundary between analysis and metaphor. A scientific-philosophical style requires precision.

The limit of analogy does not mean abandoning a powerful idea. On the contrary, the most powerful idea is that, despite radical differences in matter and mechanism, the world demonstrates recurrent relationships of form. Flower and nebula differ in almost every respect: scale, matter, time, mechanism, function and mode of observation. Similar relationships may nevertheless be recognisable within both: centre and periphery, opening, edge, lobe, radiality, asymmetry, layer and transition. These relationships constitute the subject of the hypothesis of the Matrix.

The Matrix therefore does not say, ‘Everything is a flower’. Its claim is considerably subtler: different systems may organise form through recurrent structural relationships that human thought can describe through a common language. The flower is one of the most accessible and clearly legible biological examples of this language. The nebula is one of its most extensive and complex cosmic examples. Their comparison reveals the range across which morphological invariants may operate—from living tissue to interstellar gas.

In this sense, the flower may be a key to interpreting the nebula, but not an explanation of the nebula. A key opens a door, but does not replace the room. Floral form helps reveal centre, periphery and opening. It is then necessary to proceed to astrophysics: gas, dust, radiation, gravity, stellar winds, shock waves, magnetic fields and projection. If this transition is made, the analogy becomes mature. If it is not, it remains superficial.

The nebula may likewise provide a key to a new understanding of the flower. The comparison operates in both directions. Cosmic form demonstrates that certain relationships—centre, edge, radiality, lobe and opening—do not belong exclusively to living nature. The flower ceases to be the sole bearer of these relationships and becomes a local biological manifestation of a broader morphological grammar. This does not deprive the flower of its biological uniqueness. On the contrary, it demonstrates that biology constitutes one level of a general language of form.

The limits of analogy are also important to the subsequent chapters of the cosmic part. After nebulae, the study may consider galaxies, star clusters, cosmic webs or other structures. The temptation to make visual comparisons will arise in every case. Section 15.5 establishes the rule: any comparison is permissible only when visual resemblance, morphological invariant and physical mechanism are distinguished. This rule must become the foundation of the entire cosmic part of the study.

Three key illustrations may be proposed for this section. The first would be a comparative pair, ‘nebula — flower’, in which the centre, lobes and periphery are visually identified, while the caption emphasises the difference between their mechanisms (*Fig. 13*). The second would be a methodological diagram of the ‘three levels of analogy’: visual resemblance, morphological invariant and physical mechanism (*Fig. 14*). The third would be a comparative diagram of the differences between the flower as biological morphogenesis and the nebula as astrophysical morphogenesis (*Fig. 15*). These images should conclude the chapter not through emotional effect, but through methodological clarity.

Illustration 14 would be particularly important. At the upper level, it would present two images—a flower and a nebula—connected through visual resemblance. The middle level would identify the shared invariants: centre, periphery, edge, lobe and opening. The lower level would present the different mechanisms: biological growth and astrophysical dynamics. Such a diagram would be central to the entire chapter because it would explain how the analogy should be interpreted. It would simultaneously permit and limit the comparison.

Thus, nebulae may be regarded as forms of cosmic morphogenesis, but only when the levels are rigorously distinguished. They are non-equilibrium systems within which gas, dust, radiation, gravity, stellar activity, turbulence and shock waves create complex visible structures. Within them, it is possible to identify centre and periphery, active edges, opening, rupture, ejection, shells and lobes. These features may be compared morphologically with flowers, leaves, mountain folds and submarine forms. Such comparison, however, does not constitute evidence of identity.

The nebula and the flower are different objects, different levels of matter, different temporal regimes, different modes of observation and different mechanisms of form-generation. Their connection is possible only at the level of morphological invariants. It is precisely this level that constitutes the subject of the hypothesis of the Matrix. It does not assert that the cosmos is biological or that the flower is astrophysical. It proposes that relationships of form may recur within different systems and require a distinctive language of description.

The limits of analogy do not destroy the comparison between nebula and flower, but make it valid. Comparison is permissible when it concerns centre, periphery, edge, opening, lobation, radiality and other morphological invariants. It becomes impermissible when it erases the distinction between biological growth and astrophysical dynamics. At the cosmic level, the Matrix manifests itself not as the literal repetition of a flower in the sky, but as the recurrence of structural relationships within entirely different matter: gas, dust, light, gravity and stellar energy. This is precisely why the nebula becomes one of the most powerful, yet methodologically demanding, objects of morphogenetic analysis.

Fig. 1. Nebula as a Non-Equilibrium Cosmic System: Gas, Dust, Radiation, Gravity, and Stellar Activity

Fig. 2. Gas-and-Dust Structure of a Nebula: Luminous Regions, Dark Dust Lanes, Filaments, and Active Margins

Fig. 3. Cosmic Morphogenesis as the Interaction of Compression, Expansion, Ionisation, and the Dispersion of Matter

Fig. 4. Centre of a Nebula as a Region of Activity: Star, Dense Core, or Source of Radiation

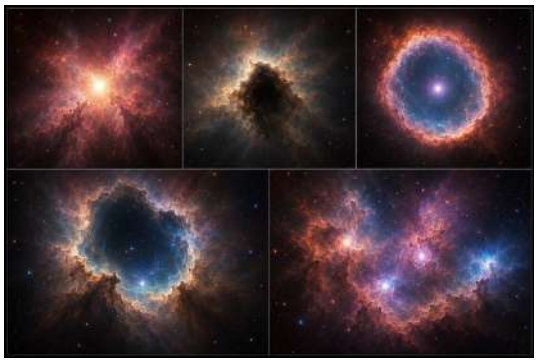

Fig. 5. Types of Centre in a Nebula: Luminous Centre, Density Core, Centre of Expansion, Cavity, and Multiple Centres

Fig. 6. Morphological Comparison of a Flower and a Nebula: Centre and Periphery as a Common Invariant despite Differences in Mechanism

Fig. 7. Scalloped Margin of a Nebula as an Active Zone of Interaction between Gas, Dust, Radiation, and the Surrounding Environment

Fig. 8. Torn and Filamentary Margins of a Cosmic Cloud as Traces of Expansion, Turbulence, and the Heterogeneity of Matter

Fig. 9. Morphological Comparison of Active Margins: Leaf, Petal, Mountain Relief, Submarine Lobe, and Nebula

Fig. 10. Cosmic Unfolding of Form: Expansion of a Gaseous Envelope from the Region of Activity towards the Periphery

Fig. 11. Rupture and Ejection in a Nebula as Morphological Traces of Stellar Activity and the Interaction of Matter with the Environment

Fig. 12. Scheme of Cosmic Morphogenesis: Rupture, Ejection, Expansion, Envelope, and Active Margin

Fig. 13. Nebula and Flower: Visual Similarity despite the Difference between Biological and Astrophysical Mechanisms

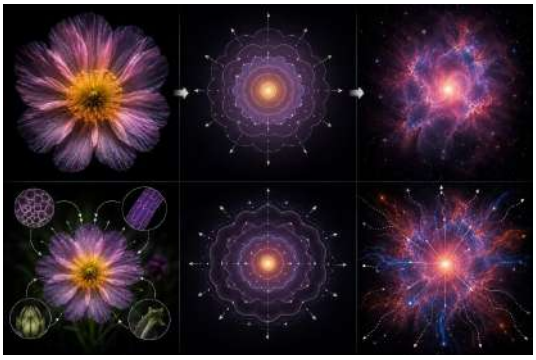

Fig. 14. Three Levels of Analogy: Image, Morphological Invariant, and Physical Process

Fig. 15. Flower as Biological Morphogenesis and Nebula as Cosmic Morphogenesis: Limits of Comparison

Chapter Sixteen

Galactic and Spiral Structures

16.1. The Spiral as a Universal Motif

The spiral is one of the most persistent and expressive forms encountered in nature, mathematics, culture and cosmic structures. It appears in shells, plants, seed arrangements, succulent rosettes, vortices, cyclones, galaxies, fractal images, ancient ornaments and sacred geometry. The spiral therefore occupies a distinctive position within the hypothesis of the Unified Matrix of the Universe. It connects centre and periphery, repetition and development, circle and line, return and forward movement. Within it, form is neither simply enclosed nor simply directed outwards; it unfolds around a centre, preserving the memory of the preceding turn while simultaneously passing to a new level.

The universality of the spiral must not, however, be understood crudely or literally. A shell, plant, atmospheric cyclone, whirlpool, spiral galaxy and mathematical fractal do not share the same mechanism of origin. A shell is connected with biomineralisation and the growth of an organism. Spiral organisation in plants is associated with the arrangement of growing organs, spatial packing, access to light and biological organisation. A vortex arises within a moving liquid or gas. A cyclone forms in the atmosphere through pressure, the Earth's rotation, temperature contrasts and air currents. A spiral galaxy is associated with gravity, rotation, the distribution of stars, gas and dust, and the large-scale dynamics of the galactic disc. A fractal spiral may result from mathematical iteration. The spiral as a motif must therefore be examined at the level of the morphological invariant rather than as a single physical cause.

In the most general terms, a spiral may be described as a line or structure that moves away from a centre while remaining connected with it through rotational movement. Unlike a circle, a spiral does not close upon a single radius. It returns to a similar direction, but at a different distance from the centre. In this sense, the spiral is not a form of complete repetition, but of repetition with displacement. Each turn resembles its predecessor but does not coincide with it. The spiral is therefore particularly important to understanding becoming: it demonstrates that development may be cyclical and progressive at the same time.

The circle expresses an enclosed whole. The line expresses direction. The spiral unites them. It preserves the centredness of the circle while carrying form beyond simple closure. It possesses the directionality of the line without losing its return towards the centre. The spiral may therefore be regarded as one of the most powerful morphological figures of transition: from potential wholeness to an unfolded structure, from repetition to growth, from centre to periphery, and from a closed cycle to an open history. In this sense, the spiral naturally continues the models already examined in the book: the seed-circle, leaf-like unfolding and the A–B–C–D cycle.

The spiral is particularly important because it makes movement visible. Even when spiral form is fixed within a shell, plant rosette, galactic image or ornament, the eye perceives it as a trace of process. It appears to preserve a trajectory: beginning, turn, expansion, repetition and periphery.

It is difficult to perceive a spiral solely as a static figure. It always indicates movement, growth, rotation, accumulation or distribution. The spiral is therefore not merely a geometric motif, but a form of memory within which structure preserves the trace of unfolding.

At the biological level, the spiral is frequently associated with growth and packing. In plants, spiral organisation may manifest itself in the arrangement of leaves, seeds, scales, petals, cones, succulent leaf modules and inflorescences. Such organisation may be associated with the optimal arrangement of elements around a growth point, minimisation of overlap, access to light, spatial economy and the internal laws governing meristem development. Biological spirality must not, however, be reduced to the popular formula of the 'golden ratio' or 'Fibonacci numbers'. Fibonacci sequences or related angular patterns do indeed occur within certain plant structures, but not every natural spiral is Fibonacci-based, and not every spiral form should be explained through the golden ratio. For the hypothesis of the Matrix, the principle of rotational, repeated and expanding arrangement is more important than any particular numerical dogma.

Shells provide another biological example. Many shells demonstrate spiral accretion: the organism enlarges its dwelling in such a way that a new part is added to what already exists, preserving the general type of form while simultaneously increasing its scale. Morphologically, this is highly significant: here, the spiral records growth through the preservation of proportion. The shell does not simply become larger; it accumulates form around a centre while retaining a recognisable geometry. The connection between spiral and the memory of growth is especially clear within such a structure: each new turn continues the preceding one.

A shell is not, however, a physical model of a galaxy. Their visual resemblance may be powerful, but their mechanisms are fundamentally different. A shell is the product of biological growth and the mineralised structure of an organism. A galaxy is a gravitationally bound system of stars, gas, dust and dark matter. In the first case, the spiral arises through the biological accretion of material; in the second, through the cosmic dynamics of a rotating disc and the distribution of matter. The comparison between a shell and a galaxy is therefore permissible only as a morphological analogy involving centre, turn, increasing radius, repetition with displacement and transition towards the periphery.

Vortices and cyclones reveal the spiral as a form of movement within a medium. Here, the spiral is neither a solid body nor an organ. It arises within a flow. In a whirlpool, atmospheric vortex or cyclone, matter moves around an area of lower or distinctive pressure, forming a rotating structure. Such a spiral demonstrates the connection between form and dynamics with particular clarity: if the movement ceased, the form of the vortex would also disappear. Unlike the shell, in which the spiral is fixed within solid material, the vortex spiral exists as a mode of movement. It is a form of process in its purest expression.

The cyclone as an atmospheric structure is particularly important to understanding spiral organisation at large scales. It demonstrates that rotation, pressure, flow, temperature, humidity and planetary conditions may create a large-scale spiral structure. Viewed from space, a cyclone frequently resembles an immense curl, eye, spiral disc or rotating rosette. It is neither a biological form nor a galaxy, but an atmospheric dynamic. Morphologically, however, it possesses a centre, arms of cloud flows, a periphery, rotation and an active edge. These features make it an important intermediate example between terrestrial flows and cosmic structures.

Galactic spirality carries the spiral motif to the largest scale. Spiral galaxies possess a central region, disc and arms within which stars, gas, dust and regions of star formation are distributed. Visually, such a structure may resemble a rose, shell, whirlpool, succulent rosette or vortex. Its

physical nature, however, is connected with gravity, rotation, density structures, the movement of matter and the history of galactic development. A galaxy is neither a flower nor a living organism. It nevertheless demonstrates a powerful morphological invariant: the centred rotational unfolding of matter into arms.

The spiral galaxy is particularly important to the hypothesis of the Matrix because it combines several invariants simultaneously. First, it possesses a centre—a region in which mass, stars and gravitational organisation are concentrated. Second, it possesses a disc—a plane across which matter is distributed. Third, it possesses arms—extended spiral structures connecting centre and periphery. Fourth, it possesses rotation—a dynamic principle without which the spiral structure cannot be understood. Fifth, it possesses multiscale heterogeneity: the arms are not smooth lines, but contain star-forming regions, dust, clouds of gas, and bright and dark zones. The galaxy therefore provides a cosmic image of spiral self-organisation, but requires rigorous astrophysical differentiation.

The spiral as a universal motif may be considered across several dimensions. The first is geometric. Here, the centre, radius, turn, pitch, angle, direction of rotation, distance between turns and degree of expansion are important. These parameters differ among different types of spirals. Archimedean spirals, logarithmic spirals, spiral fractals and natural spiral structures possess different properties. A scientifically valid description therefore requires clarification of the type of spiral involved and whether it constitutes a strict mathematical form or merely a naturally spiral-like structure.

The second dimension is processual. The spiral reveals not only a form, but also a mode of becoming. It may arise through growth, rotation, flow, deformation, packing, the distribution of matter, gravitational dynamics or mathematical iteration. If geometry answers the question ‘What does the spiral look like?’, processual analysis asks, ‘How did it arise?’ It is precisely here that the boundary lies between the morphological invariant and the physical mechanism. The form may be similar while the process is different. This distinction is fundamental to the hypothesis of the Matrix.

The third dimension concerns scale. The spiral occurs from microstructures and biological forms to atmospheric and galactic scales. Scale, however, changes everything: the speed of processes, type of matter, role of the environment, modes of observation, duration of existence and degree of stability. A small plant curl may be observed directly. A cyclone may be observed through satellite imagery. A galaxy may be observed through telescopes and data processing. Comparisons between spirals must therefore always take account of scale and mode of representation. A shared visual category does not imply the same ontological status.

The fourth dimension is philosophical. The spiral is an image of time, development and return without complete repetition. Within a circle, beginning and end coincide. Along a straight line, movement departs from its origin without returning. A spiral contains both return and departure. It returns to a similar direction, but at another level. For this reason, the spiral is frequently used as a symbol of evolution, growth, memory, cyclicality, development, renewal and transition. This is especially important to the hypothesis of the Matrix: the A–B–C–D model is likewise not a simple circle. The completed form returns to a new A, but only after passing through the cycle and acquiring new structural memory. This is not circular repetition, but spiral return.

In this sense, the spiral may be regarded as a deepening of the cyclical model. Earlier in the book, the A–B–C–D model represented a sequence: a closed state, initial opening, a multilayered structure, full manifestation and transition to a new beginning. If this cycle is repeated, however,

it should not be understood as a mechanical return to the same point. A new seed is not the previous seed; a new layer is not identical to the old one; and a new structure carries the trace of the preceding process. The repetition of the cycle may therefore be understood spirally: each new turn returns form to the beginning, but at another level.

The spiral also helps explain the relationship between centre and periphery. In a radial form, the centre may spread outwards directly along rays. In a spiral, this spreading proceeds through turning, delay, displacement and gradual expansion. The periphery does not simply move away from the centre; it preserves a curving connection with it. The arm of a galaxy, the curl of a shell, the arrangement of seeds within a disc and a vortex flow all demonstrate that centre and periphery are connected not by a straight line, but by an unfolding trajectory. This relationship is more complex than simple radiality. It introduces time, rotation and sequence.

Spiral unfolding may be regarded as a distinctive form of symmetry breaking. An initial circle or centre possesses potential uniformity. The spiral disrupts that uniformity by establishing a direction of rotation. It creates right- or left-handed orientation, inner and outer regions, and a beginning and continuation of the turn. This does not destroy order, but makes it more complex. Symmetry does not disappear completely within the spiral, but becomes dynamic. It is preserved as the repetition of turns and simultaneously disrupted through progressive expansion. The spiral is therefore a form of organised asymmetry.

At the botanical level, this may be observed in rosettes, cones, seed arrangements and petal structures. The plant centre does not simply project elements chaotically. Elements are arranged with a particular angular displacement, creating dense, efficient and visually stable packing. This is especially evident in a succulent rosette or sunflower disc: the centre remains visible, but the entire form exists as a rotational distribution of modules. Such a structure unites radiality and spirality. It is not only beautiful, but functional, since it enables dense arrangement and growth.

At the geological level, strict spiral forms occur less frequently, although spiral-like and vortical motifs may appear in lava flows, curled sedimentary structures, vortex traces, and certain mineralogical and erosional forms. Caution must again be exercised. Not every curve or arc is a spiral. Geological material requires precise description: curl, arc, wave, ring structure, vortex trace or spiral-like form. Where rotational organisation is genuinely visible, however, it may be incorporated into the broader morphological sequence.

In hydrodynamics, spirality is connected with flow. Water, air or plasma may form rotating structures when movement acquires a rotational component. The vortex demonstrates that a spiral may be not a body, but a mode of movement. This insight is especially important at the cosmic level. Galactic arms and structures of gas and dust should likewise not be understood as solid lines. They are distributions of matter and dynamic processes. Here, the spiral exists as a form organising movement and density rather than as a material wire in space.

Fractal images introduce another type of spirality: the mathematically generated spiral. Within such structures, a spiral may arise through the repetition of simple rules, iteration, scaling and rotation. This is particularly important to the hypothesis of the Matrix because it demonstrates that a complex spiral form may result from relatively simple procedures. Caution is again necessary. A mathematical fractal is not a natural object in the direct sense. It is a model or visualisation of a mathematical process. Its significance lies in helping us understand how repetition, scaling and rotation may create complex form.

The spiral as a motif connects fractality with growth. If a form repeats its principle across different turns, if each subsequent turn preserves a relationship with its predecessor, and if the scale changes while the general logic remains recognisable, the spiral becomes a bearer of self-similarity. A shell, plant structure, vortex flow, galactic disc and fractal spiral demonstrate different types of this relationship. In some cases, self-similarity is approximate and natural; in others, it is more rigorously mathematical. In every case, however, the spiral demonstrates how form may preserve identity through changes of scale.

Within the hypothesis of the Unified Matrix of the Universe, the spiral should be regarded as one of the key invariants, but not as an absolute universal key to every form. Not every form is spiral. Not every morphogenetic process follows a spiral. Some forms are radial, branching, layered, networked, linear, fractal without pronounced spirality, chaotic or combined. The spiral should therefore not displace other invariants. Its significance lies in the exceptional clarity with which it unites several principles: centre, rotation, growth, repetition, expansion, asymmetry and the connection between cycle and development.

The spiral also facilitates the transition from nebulae to galaxies. Chapter 15 examined nebulae as forms of cosmic morphogenesis: cloudy, shell-like, filamentary, lobate, ruptured and non-equilibrium structures. In Chapter 16, attention shifts towards more highly organised spiral cosmic structures, above all galaxies. Whereas a nebula frequently demonstrates cloud-like opening, a spiral galaxy demonstrates the rotational distribution of matter around a centre. This is another type of cosmic form: not merely expansion and ejection, but centred rotation.

The galactic spiral is especially attractive for visual comparison with the rose. A rose possesses a centre and multilayered petals, frequently arranged with rotational displacement. A spiral galaxy possesses a nucleus and arms unfolding around its centre. Visually, this resemblance may be powerful. Section 16.2 will be devoted specifically to the cautious use of the ‘rose — spiral galaxy’ pairing. It should already be emphasised, however, that a rose and galaxy are not the same object and do not form through the same mechanism. Their comparison is permissible only as an example of radial-spiral morphological organisation.

In this respect, the present section establishes the methodological foundation for the entire chapter. The spiral is considered not as a mystical sign, proof of the absolute unity of all processes or decorative metaphor, but as a structural motif recurring within different systems. It may be analysed through its centre, turns, radius, pitch, direction, periphery, scale, type of material and mechanism of formation. Such analysis makes it possible to maintain a balance between the breadth of the hypothesis and scientific caution.

It is particularly important to distinguish three levels of discussion concerning the spiral:

- The first level is visual: the object resembles a spiral.
- The second level is morphological: a centre, rotational displacement, turns, expansion and a connection with the periphery may be identified within the object.
- The third level is physical or biological: it is necessary to explain why and how such a structure arose within the particular system.

Error begins when the first level is mistaken for the third. Visual resemblance to a spiral is not yet an explanation. When spiral features are described and related to a mechanism, however, the analysis becomes substantive.

The second, morphological level is particularly important to the Matrix. It is here that the spiral becomes an invariant. It may be expressed within different materials, but each time preserves a

particular relationship: centre — rotation — turn — expansion — periphery. This relationship constitutes the subject of comparative analysis. If it recurs within plants, shells, vortices, cyclones, galaxies and fractal models, the spiral may be described as one of the universal motifs of form-generation. Universality here means not a single mechanism, but a recurrent structural grammar.

Within the A–B–C–D model, the spiral may be described as follows. A is the centre or initial region of concentration. B is the first displacement, the disruption of simple radial symmetry and the emergence of a direction of rotation. C is the development of turns, expansion, repetition with a changing scale, and the formation of arms, layers or modules. D is the stabilised spiral form: shell, rosette, vortex, galactic disc or fractal structure. A new A may arise within a new centre, the next turn, a subsidiary structure or the repetition of the principle at another scale. This scheme does not replace specialised mechanisms, but helps describe the morphological sequence.

Spiral return is particularly important to understanding a new A. Within a simple circle, return leads back to the same point. Within a spiral, return leads to a similar position, but at a different radius or level. A new A within spiral logic is therefore not a simple repetition of the old A. It is a new centre or point of departure arising after the completion of a cycle. In biology, this may be a new seed following flowering. In geology, a new sedimentary cycle following the destruction of form. In space, a new region of star formation within redistributed matter. In culture, a new symbolic version of an ancient motif. The spiral provides a language for such non-identical return.

The spiral as a universal motif is consequently one of the most profound figures of morphogenetic thought. It demonstrates that development is not always linear and not always enclosed. It may be cyclical and progressive. It may return without repeating itself completely. It may retain a centre while expanding its periphery. It may preserve a principle while changing scale. This is why the spiral occurs in such diverse fields and so frequently becomes a symbol of life, movement, the cosmos, time and self-organisation.

The illustrations for this section should present the spiral as a motif connecting different levels without conflating their mechanisms. The first illustration might be comparative: a shell, plant rosette, vortex and spiral galaxy as different manifestations of spiral organisation (*Fig. 1*). The second might be a geometric diagram of the spiral: centre, turn, radial expansion, pitch, direction and periphery (*Fig. 2*). The third might be a diagram distinguishing biological, hydrodynamic, atmospheric, galactic and mathematical-fractal spirals (*Fig. 3*). These illustrations should not merely demonstrate the beauty of the spiral, but teach the correct morphological reading of it.

Thus, within the hypothesis of the Unified Matrix of the Universe, the spiral should be understood as one of the key invariants of morphogenesis. It expresses the transition from centre to periphery through rotation and repetition with displacement. It unites cycle and development, closure and opening, memory and novelty, symmetry and asymmetry. It may be identified within shells, plants, vortices, cyclones, galaxies and fractal images, but morphological similarity and physical mechanism must be distinguished in every case. The principal conclusion of the section is that the spiral does not constitute proof of the literal unity of all objects, but provides a powerful language for describing a recurrent principle of form: the centre remains, movement continues and the turn is repeated, yet each new level no longer coincides with the one before it.

16.2. The Galaxy and the Rose

The visual pairing ‘rose-spiral galaxy’ is one of the most powerful and, at the same time, most methodologically hazardous analogies within the cosmic part of the hypothesis of the Unified Matrix of the Universe. On the one hand, the resemblance may indeed be striking: a rose possesses a centre around which multilayered petals unfold spirally, while a spiral galaxy possesses a central region from which curving arms extend. In both cases, the eye perceives a centred form, the rotational displacement of elements, a transition from internal concentration to an opened periphery, and a complex distribution of layers or arms. On the other hand, a rose and a galaxy belong to entirely different levels of matter, time, scale and causality. They cannot be identified with one another.

A rose is a living botanical object. Its form arises through biological morphogenesis: cell division, tissue growth, organ differentiation, meristem activity, inherited programmes, hormonal regulation, mechanical stresses, water balance, lighting conditions and the development of the flower from a bud. The petals of a rose are living or formerly living plant tissues possessing a base, surface, venation, edge, colour, elasticity and function within the structure of the flower. Their arrangement is associated with the biological architecture of the plant and the process through which the bud opens.

A spiral galaxy is an astrophysical system. Its form arises not from cellular growth or a biological programme, but from gravitational organisation, rotation, the distribution of stars, gas, dust and dark matter, density structures, the dynamics of the galactic disc, star formation and prolonged cosmic evolution. Galactic arms are not petals. They do not consist of living tissue, do not open as plant organs and possess no biological function. They are extensive regions of increased brightness and concentrations of stars, gas, dust and star-forming processes, perceived as spiral structures within the galactic disc.

Comparison between the rose and galaxy is therefore permissible only at the level of morphological invariants. It is possible to speak of similarities involving the centre, periphery, radiality, spirality, multilayered organisation, rotational unfolding and transition from an inner to an outer region. It is not permissible to say that a galaxy is a rose, that a rose is a miniature galaxy, that they possess a single physical code, or that biological growth and galactic dynamics are the same process. Such a direct identification would be scientifically incorrect and methodologically destructive to the hypothesis.

The importance of the ‘rose-galaxy’ pairing lies not in the identity of the objects, but in the clarity with which they demonstrate a shared morphological relationship. The rose demonstrates the spiral and layered opening of a living form. The galaxy demonstrates the spiral and dynamic distribution of cosmic matter. In both cases, it is possible to identify a centre, rotational displacement, peripheral expansion and a complex organisation of edges. These features must, however, be treated as elements of a comparative language of form rather than as evidence of a common mechanism.

The rose is particularly convenient for such a comparison because its petals are frequently arranged not merely in circles, but with a discernible displacement relative to one another. The inner petals may be more densely gathered, the outer petals more widely opened, and their edges undulating or curved. A dense concentration is visible at the centre, from which the form gradually passes towards the periphery. This organisation creates an impression of rotational opening: the

eye moves from the centre towards the outer petals along a curvilinear trajectory. The rose is therefore perceived not as a simple radial figure, but as a complex spiral-radial structure.

A spiral galaxy is likewise perceived through its centre and arms. The central region may consist of a bright nucleus, bulge or extended central structure. The arms unfold around the centre, creating an impression of rotation and the distribution of matter. Galactic arms, however, are not material 'petals' in a solid sense. They are dynamic regions of the galactic disc within which stars, gas and dust are distributed in such a way that a spiral pattern appears in the observed image. Their form is associated with movement, gravity and large-scale dynamics rather than tissue growth.

This constitutes the first limit of the analogy. The spirality of a rose is associated with the development of a plant organ from a bud. The spirality of a galaxy is associated with the cosmic dynamics of a rotating disc. The petals of a rose possess specific tissues and boundaries. Galactic arms are extended regions in the distribution of matter rather than rigid elements. The opening of a rose may be observed over a human timescale. Galactic dynamics unfold over millions and billions of years. Their visual forms may be comparable, but their causality differs.

The second limit of the analogy concerns scale. The rose belongs to biological and human scales. It may be observed directly, examined closely, dissected, studied under a microscope and followed as its bud opens. The galaxy belongs to the cosmic scale. Its image is produced through telescopic observations and the processing of light, sometimes across different spectral ranges, while its actual structure encompasses immense distances. The comparison between rose and galaxy therefore connects forms separated by a colossal difference in scale. This difference does not prohibit morphological comparison, but makes it strictly conditional.

The third limit concerns time. A rose opens within the life cycle of a plant. Its form changes relatively rapidly. The bud, partially opened form, open flower, wilting, fruit and seed stage may all be related to observable biological time. A galaxy, by contrast, exists within cosmic time. Its spiral structure changes extraordinarily slowly by human standards. We observe not a 'moment of opening' in the biological sense, but the state of an immense dynamic system whose light has reached the observer after a prolonged journey. The term 'opening' may therefore be used in relation to a galaxy only morphologically and metaphorically, not literally.

The fourth limit concerns function. A rose as a flower is incorporated into the biological cycle of the plant. Its structure is associated with reproduction, protection of internal organs, interaction with the environment, colour, scent, attraction of pollinators and other biological strategies. A galaxy possesses no function in the organic sense. It does not exist 'in order' to open, does not strive to flower and possesses no plant life cycle. It is a gravitationally organised cosmic system. Any reference to the 'flowering of a galaxy' is therefore permissible only as a poetic metaphor, not an analytical formulation.

When these limits are respected, however, the 'rose-galaxy' pairing becomes highly productive. It demonstrates that spiral-radial organisation may arise within systems that are entirely different in nature. In a rose, it manifests itself through the biological opening of layers. In a galaxy, through the cosmic distribution of matter around a centre. In both cases, the visible form is constructed neither as a simple circumference nor as a chaotic field, but as an organised movement from centre to periphery through curvilinear displacement. It is precisely this relationship that constitutes the subject of morphological comparison.

The rose demonstrates one form of layered spirality. Its petals overlap one another, creating inner and outer levels. Each layer does not simply repeat its predecessor, but shifts, expands, curves and opens a new periphery. The inner petals are more tightly gathered and protected, while the outer petals are more open and come into contact with the environment. Such a structure corresponds well to the general model of the Matrix: a closed state, initial opening, multilayered unfolding, an active edge and transition towards the periphery.

The galaxy demonstrates another type of spirality: distributive and dynamic. Its arms are not layers in the same sense as the petals of a rose. They nevertheless create a visible structure within which matter is organised around the centre and unfolds in a spiral direction. The arms may contain luminous star-forming regions, clouds of gas and dust, young stars and dust lanes. Visually, this creates an effect of cosmic 'unfolding' from the centre outwards. The effect must, however, be understood as the observed morphology of the galactic disc rather than as the actual opening of petals.

The resemblance between rose and galaxy may be described through several invariants. The first is the centre. In a rose, the centre is a biological region of the flower associated with its internal organisation. In a galaxy, the centre is a region of gravitational and luminous concentration. In both cases, the centre organises perception of the form, although its nature differs. The second invariant is the periphery. In a rose, the periphery is expressed through the outer petals and their edges. In a galaxy, it is expressed through the outer regions of the disc, arms, diffuse matter and weaker luminosity. The third is spiral displacement. In a rose, this is expressed through the arrangement of petals; in a galaxy, through the arms. The fourth is layering or multizonal organisation. In a rose, this consists of petal levels; in a galaxy, regions of differing density, brightness, composition and stellar population age. The fifth is the active edge. In a rose, this is the edge of a petal; in a galaxy, the outer regions of the arms, dust structures and transitions towards peripheral regions.

Each of these invariants must be described at two levels: morphological and mechanistic. Morphologically, the centres of the rose and galaxy are comparable as nodes of organisation. Mechanistically, they differ. Morphologically, petals and arms are comparable as diverging curvilinear elements. Mechanistically, petals consist of tissue, while arms are dynamic galactic structures. Morphologically, the edge of the rose and the periphery of the galaxy may be compared as active boundaries of form. Mechanistically, one edge is biological and the other cosmic. This dual description makes it possible to use the analogy without compromising scientific validity.

It is especially important not to transform galactic arms literally into 'petals'. Permissible formulations include 'petal-like morphology', 'arms visually resembling petal-like unfolding', 'spiral-lobate organisation' and 'the morphological resemblance of galactic arms to the arrangement of petals in a rose'. It is undesirable, however, to say that 'the galaxy possesses petals', 'the galaxy opens like a rose' or 'the rose and galaxy are the same form'. Such formulations are too strong and create the false impression of biologising the cosmos.

The 'rose-galaxy' pairing also helps clarify the concept of radiality. Within a simple radial form, elements diverge from a centre along rays. In the rose and galaxy, radiality is made more complex by spirality. Elements do not simply extend directly from the centre outwards, but unfold while turning. It is therefore more accurate to speak of radial-spiral organisation. The rose is not solely radial: its petals create rotational displacement. A spiral galaxy is likewise not merely a circular

disc: its arms create curvilinear structures. In both cases, form arises through the union of centre, rotation and peripheral expansion.

This combination is particularly important to the Matrix. In the earlier chapters, centre and radiality were connected with the flower, seed structure, succulent and nebulae. A rotational dimension is now added to them. If radiality demonstrates propagation from a centre, spirality demonstrates propagation through displacement and repetition. The rose and galaxy form a useful visual pair precisely because they demonstrate not simple radiality, but radiality made more complex through rotation. This makes them particularly powerful material for analysing spiral unfolding.

Layering within a rose and galaxy also possesses different natures. In the rose, layers consist of petals that develop from the floral primordium and open from a bud. They possess a visible surface, form, colour and edge. In a galaxy, layering may be more conditional: it may consist of differences among density regions, levels of luminosity, dust lanes, gaseous structures, stellar populations and arms. Within an image, the galaxy may appear multilayered, but this layering is not equivalent to a petal structure. It is therefore preferable to speak of the galaxy's 'multizonal organisation' or 'perceived layered structure'.

The visual pairing 'rose-galaxy' also demonstrates the role of the image. A rose may be photographed directly, although angle, lighting and lens still influence perception. A galaxy, however, is presented through a telescopic image, exposure, data processing, colour correction, scaling and sometimes the combination of different spectral ranges. The comparison therefore concerns not only the objects, but also their visual representations. This does not invalidate the comparison, but requires caution: the image of a galaxy within an illustration is scientifically and technologically mediated.

It is especially important to consider that the appearance of a galaxy depends upon the viewing angle. Its spiral structure is clearly visible when the galaxy is oriented approximately face-on towards the observer. If it is viewed edge-on, its spiral arms may be almost indistinguishable and it will appear as an elongated disc with a dust lane. A rose, by contrast, may be examined from different sides, while its petal structure remains accessible to direct observation. The 'rose-galaxy' analogy therefore depends upon the selected orientation of the galaxy. This is another limit of the comparison.

At the same time, it is precisely the face-on orientation that makes a spiral galaxy particularly expressive. In such an image, its centre and arms become legible as a planar composition. The illustrations for this section should therefore select or create images of galaxies in which the spiral structure is clearly visible from above, without a pronounced inclination. The morphological comparison with a rose will then be more valid. If an edge-on galaxy is used, the analogy with a rose will be artificial.

The rose must likewise not be selected arbitrarily. Not every rose demonstrates spirality with equal clarity. A rose photographed from above or at a slight angle is preferable for comparison, so that the centre, tightly wound inner petals and opened outer layers are visible. An excessively chaotic, damaged or densely double form may make analysis more difficult. The purpose of the illustration is not merely to display a beautiful rose, but to reveal specific invariants: centre, petal spiral, layers, periphery and edge.

An ideal comparative illustration should be analytical rather than decorative. The rose and galaxy may be placed beside one another as two forms demonstrating a similar principle of radial-spiral

unfolding. Minimal graphic overlays may also be employed to indicate the centre, curves of spiral movement and peripheral zones. Such overlays should remain restrained, however, so that the image does not become an arbitrary diagram. The resemblance should be demonstrated while the distinction is simultaneously preserved: one side presents a biological form and the other a cosmic structure.

The ‘rose-galaxy’ pairing may be interpreted through the A–B–C–D model. For the rose, A is the closed bud; B, the initial opening; C, the multilayered spiral unfolding of the petals; D, the opened flower; and a new A, the fruit or seed. In the case of the galaxy, the scheme may be used only with considerably greater caution. A may designate an initial region of concentrated matter or an early state of the galactic system; B, the onset of rotational organisation and differentiation of the disc; C, the development of spiral arms and distribution of matter; and D, the observed spiral galaxy as a temporarily stable cosmic form. This scheme is not an astrophysical model of galaxy formation. It merely assists in describing the morphological sequence of centredness and spiral unfolding.

Here again, the principal rule of the study becomes apparent: the A–B–C–D model must not substitute for specialised sciences. In biology, it may correspond more closely to the actual observable cycle of a flower. In cosmology, it is a metamorphological scheme describing the structure of form rather than explaining every physical process. When applying the model to a galaxy, the text should therefore use such qualifications as ‘provisionally’, ‘morphologically’, ‘at the level of structural language’ and ‘without replacing the astrophysical mechanism’. Such caution preserves scientific integrity.

The galaxy and rose also make it possible to discuss the beauty of form. In both cases, the form is perceived as aesthetically powerful. The rose is traditionally associated with the beauty of living nature. A spiral galaxy evokes a sense of cosmic harmony and scale. Aesthetic impression must not, however, replace analysis. Beauty may provide an entry into the study because it causes us to notice structure. It must then lead to questions: Which elements organise this beauty? Where is the centre? How is the periphery structured? How are the layers or arms repeated? Where is the edge visible? How does the form preserve wholeness despite its complexity? In this way, aesthetic perception is translated into morphological thought.

Philosophically, the ‘rose-galaxy’ pairing is especially powerful because it unites the small and the immense. In the rose, a person observes a local living form accessible to the hand and eye. In the galaxy, a person observes a cosmic form inaccessible to direct experience. Their comparison demonstrates that morphological relationships may remain recognisable despite a radical change in scale. This does not mean that scale is unimportant. On the contrary, scale differentiates mechanisms. The recognisability of form across changes in scale nevertheless provides one basis for asking whether the Matrix may function as a language of invariants.

Anthropocentric error must, however, be avoided. Human beings tend to perceive familiar forms within complex objects. This tendency may intensify analogies. We may see a rose in a galaxy, an eye in a nebula, a tree in lightning or a face in stone. Every visual comparison must therefore be tested against identifiable features. If the galaxy genuinely possesses a centre, arms, spiral distribution, periphery and multizonal organisation, the analogy with the rose has a morphological basis. If the resemblance rests solely upon an emotional impression, it remains weak. The ‘rose-galaxy’ pairing must therefore be analysed through specific structural elements.

It is particularly important in a scientific-philosophical text not to strengthen the analogy artificially. There is no need to assert that the galaxy ‘flowers’, ‘has petals’, ‘is a cosmic rose’ or ‘repeats the biological law of the rose’. It is considerably more precise to say that a spiral galaxy

may be compared with a rose as an example of the radial-spiral unfolding of form around a centre, while their biological and astrophysical mechanisms remain entirely different. Such a formulation preserves both resemblance and boundary.

The ‘rose-galaxy’ pairing also helps demonstrate the distinction between a symbol and a model. In culture, the rose frequently symbolises beauty, love, mystery, life, perfection, centre and opening. Within modern imagination, the galaxy may symbolise the cosmos, infinity, order, scale and the mystery of the Universe. In the present book, however, their symbolic meanings must remain secondary to morphological analysis. The rose and galaxy are not being compared as symbols of beauty. They are being compared as two structures within which centre, spirality, periphery and multilayered organisation may be identified.

This distinction is particularly important because the rose as a cultural symbol possesses an immense semantic field. It may draw the discussion towards mysticism, religious symbolism, poetry or aesthetics. These levels are not prohibited, but Chapter 16 has a different purpose: galactic and spiral structures must be considered as the cosmic level of the Matrix. The rose is therefore used here not as a cultural symbol, but as a biological form suitable for morphological comparison. Its symbolism may be mentioned only cautiously and as a secondary matter.

The spiral galaxy must likewise not be transformed into a symbol without analysis. Cosmic images frequently produce a powerful emotional effect. Within a scientific-philosophical book, however, it is important to perceive the physical system behind them: centre, disc, arms, dust lanes, star-forming regions, distribution of matter and rotation. Only then does the galaxy become not a beautiful background, but an object of morphological analysis. The ‘rose-galaxy’ pairing must therefore be founded upon disciplined observation.

The concept of the arm possesses particular significance. In ordinary perception, a galactic arm may appear analogous to a petal. An arm, however, is neither a separate plate nor an organ. It is an extended region of the galactic disc within which the distribution of matter and brightness creates a spiral pattern. The arms may contain regions of active star formation, clouds of gas, dust and young stars. The term ‘arm’ is itself metaphorical, although established within astronomical language. It may therefore be used, but comparison with a petal must acknowledge that ‘arm’ and ‘petal’ differ in nature.

A rose petal possesses a base, surface and edge. It belongs to the body of the flower. A galactic arm possesses no material boundary comparable to that of a petal. Its edge may be diffuse and associated with declining density and brightness, dust structures or observational conditions. The comparison ‘petal-arm’ must therefore be restricted to the relationship ‘a curvilinear element unfolding from centre to periphery’. This relationship may genuinely be compared. Everything beyond it requires differentiation.

The centres of the rose and galaxy likewise differ. In the rose, the centre may be partly concealed by petals or visible as the inner region of the flower. It is connected with biological organisation and reproductive structure. In a galaxy, the centre may be a bright central region, bulge or area with a high density of stars, and in some galaxies may be associated with an active nucleus or supermassive black hole. The visible centre of an image does not always reveal the complete physical nature of the galactic centre. Comparison between the centres of the rose and galaxy must therefore also remain morphological rather than causal.

The outer edge of the rose and the periphery of the galaxy demonstrate different types of boundary. The rose possesses definite petal edges that may be seen and touched. The galaxy

possesses a more diffuse periphery within which density and brightness gradually diminish. Its boundary is not a sharp contour. In this respect, the galaxy is closer to a nebula than to a flower. Within an image, however, its spiral arms may create the visible edge of the form. It is therefore preferable to speak not of the 'edge of the galaxy', but of the 'peripheral zone of the spiral disc' or the 'observed periphery of the arms'.

When used correctly, the 'rose-galaxy' pairing helps demonstrate one of the central propositions of the hypothesis: form may remain recognisable despite differences in matter. In the rose, form is realised within living tissue. In the galaxy, it is realised within the distribution of stellar matter, gas and dust. In both cases, morphological analysis identifies not the identity of matter, but the similarity of relationships. This is the language of the Matrix: not 'everything is made of the same thing', but 'different systems may arrive at similar structural solutions'.

This proposition is particularly important to the cosmic part of the study. Following the nebulae, within which form was cloudy, filamentary and frequently ruptured, galaxies provide a more enduring image of centred rotational order. If the nebula demonstrated a non-equilibrium cloud and an active edge, the spiral galaxy demonstrates a centre, disc, arms and prolonged organisation of matter. The 'rose-galaxy' pairing is therefore not merely beautiful; it helps translate cosmic material into the language of spiral morphogenesis.

At the same time, it must be remembered that not all galaxies are spiral. Elliptical, irregular, lenticular and other types of galaxies exist. The rose therefore cannot function as a universal model of the galaxy in general. It may be compared specifically with spiral galaxies in which a centre and arms are visible. This limitation is necessary. If it is not stated, the analogy becomes excessively broad. The hypothesis of the Matrix must operate not by extending an image indiscriminately to everything, but through the precise selection of comparable features.

Nor are all roses appropriate to the analogy. A more rigorous pairing should compare a specific rose with a specific spiral galaxy according to previously identified features: centredness, spiral arrangement, multilayered structure, curvilinear elements and peripheral expansion. If these features are present within both forms, the comparison becomes justified. If they are absent, it remains an aesthetic association. Visual pairings within the book should therefore be selected not only for beauty, but also for analytical suitability.

Three illustrations are proposed for this section:

1. A paired image of a rose and spiral galaxy positioned according to the same compositional logic: centre, spiral unfolding and periphery (*Fig. 4*).
2. An analytical overlay of spiral lines upon the rose and galaxy, demonstrating the shared morphological principle without asserting identity (*Fig. 5*).
3. A diagram of the limits of analogy: the rose as biological morphogenesis, the galaxy as astrophysical dynamics, and between them the shared invariant of radial-spiral form (*Fig. 6*).

These images would make the section methodologically clear.

The third illustration is particularly important. It should demonstrate not only the similarity, but also the difference. The shared invariant—centre — spiral — periphery—might be placed in the middle of the diagram. On one side would be the rose: tissue, petals, biological opening and flower. On the other would be the galaxy: stars, gas, dust, gravity and rotation. Such a diagram would enable the reader to understand that the Matrix does not erase differences, but creates a language through which they may be compared. This will be especially important before the transition to Section 16.3, which will examine the centre of rotation and the arms of a galaxy.

Thus, the pairing ‘galaxy and rose’ is an important but limited instrument within the hypothesis of the Unified Matrix of the Universe. It demonstrates that spiral-radial organisation may be recognisable within living and cosmic forms. It does not, however, prove a common origin or permit biological morphogenesis to be conflated with astrophysical dynamics. The rose opens as a flower; the galaxy is organised as a rotating gravitational system. Their connection lies in a morphological invariant: centre, turn, arm or petal-like lobe, periphery, repetition with displacement and transition from concentration to an unfolded structure.

The principal conclusion of the section is that the visual resemblance between a rose and spiral galaxy can be productive only when the levels are rigorously distinguished. At the first level, it is a beautiful and powerful visual analogy. At the second, it is an example of a shared radial-spiral morphological principle. At the third, it consists of two entirely different causal systems: biological growth and galactic dynamics. It is precisely this three-level understanding that transforms the analogy from a weakness in the hypothesis into a methodologically controlled instrument.

16.3. The Centre of Rotation and Spiral Arms

The spiral galaxy makes it possible to examine one of the largest-scale variants of centred form. In a rose, the centre is associated with the biological organisation of the flower and the petals with the unfolding of tissue. In a galaxy, the centre, disc and arms possess an entirely different nature. Here, the subject is a gravitationally organised cosmic system within which stars, gas, dust and other components are distributed across immense distances and participate in complex rotational dynamics. Nevertheless, the spiral galaxy provides one of the most expressive examples of how centre, rotation and peripheral unfolding may create a persistently recognisable morphological structure.

The centre of a galaxy should not be understood as the simple geometric centre of an image. Within an observed spiral galaxy, the central region may include a bright nucleus, bulge, dense concentration of stars, region of increased mass and, in certain cases, an active galactic nucleus or compact central object. For morphological analysis, however, it is important not to reduce the centre to a single point. The centre of a galaxy is a region of concentration around which the visible structure of the disc and arms is organised. It is not a symbolic ‘heart’ in the poetic sense, but an astrophysical node in the distribution of mass, light and dynamics.

For the hypothesis of the Unified Matrix of the Universe, the galactic centre is important primarily as a morphological invariant. At the biological level, the centre manifested itself within the seed, bud, heart of a flower, centre of a fruit or succulent rosette. At the geological level, it could be the core of a stone, dome, crater, source of a fault or region of uplift. At the cosmic level, the galactic centre is no longer an organ, seed or geological point, but a region of gravitational and dynamic organisation. The structural relationship nevertheless remains: a field of form is organised around a centre.

The galactic centre differs from the centre of a nebula. In nebulae, the centre could be a star, region of activity, dense core, cavity or source of radiation. In a galaxy, the centre is associated with a more persistent, large-scale organisation of the system. It is incorporated into the structure of the disc, arms, bulge and periphery. Whereas a nebula frequently demonstrates a cloudy, ruptured and filamentary morphogenetic state, a spiral galaxy possesses a more pronounced

rotational architecture. Here, form does not merely expand or disperse; it is organised around a prolonged dynamic regime.

Rotation is a key element of spiral galactic form. Without rotational dynamics, it is difficult to understand why matter is distributed not only radially, but also spirally. Rotation connects centre and periphery through curvilinear movement. It transforms the galaxy from a simple disc into a system within which the distribution of matter acquires a directional, curving structure. Rotation transforms centredness into spirality. A section concerning galaxies must therefore examine not only the form of their arms, but also the dynamic principle that makes such a form possible.

Morphologically, rotation creates a transition from simple radiality to spiral organisation. Radiality implies propagation from centre to periphery along rays. Spirality implies that this propagation is connected with turning, displacement and repetition of a trajectory. The arms of a spiral galaxy do not appear as straight rays. They curve around the centre, creating the impression of rotational unfolding. It is precisely this that makes galactic form especially close to the general motif of the spiral examined in Section 16.1.

It is important, however, not to perceive galactic arms as rigid material branches or petals. Visually, they may appear to be stable elements diverging from the nucleus. In astrophysical terms, however, arms should be understood as large-scale regions of enhanced brightness, density, gas, dust and star-forming activity within the galactic disc. They are not solid structures and do not preserve themselves in the same way that a petal preserves the form of its tissue. Their boundaries may be diffuse, heterogeneous and dependent upon the observational range. An arm is therefore not a ‘body part’ of the galaxy in the biological sense, but a dynamic morphological region.

The term ‘arm’ is itself metaphorical. It is useful because it describes an elongated spiral structure, but it must not mislead. A galactic arm does not resemble the arm of a living organism and is not a mechanical appendage. It is a region in the distribution of matter and light. Within one observational range, an arm may be highlighted by young stars and star-forming regions; within another, by dust or gas; and within a third, by overall stellar luminosity. The appearance of the arms therefore depends not only upon the physical structure of the galaxy, but also upon the mode of observation.

This circumstance is particularly important to the visual methodology of the study. An image of a galaxy is a scientific and technical representation. It depends upon the telescope, spectral range, exposure, data processing, colour coding and viewing angle. The spiral structure may be more or less apparent depending upon the galaxy’s orientation towards the observer. A face-on galaxy clearly displays its centre and arms. An edge-on galaxy may appear as an elongated disc with a dust lane, while its spirality is less evident. Morphological analysis of galactic images must therefore take the conditions of visibility into account.

The centre of rotation within a galaxy may be regarded as the region around which movement and distribution are organised. It is not necessarily a point that can be precisely identified within an image without specialised data. The visual centre, luminous centre, dynamic centre and centre of mass may not coincide perfectly within every individual system. When describing a galaxy, it is therefore necessary to distinguish between the observed central region and the physical centre of its dynamics. For morphological analysis, it is sufficient to speak of the central zone organising the spiral structure, while astrophysical assertions require specialised evidence.

Within the hypothesis of the Matrix, the centre of rotation is particularly significant because it unites two invariants: centre and movement. In the seed, the centre represented potential form. In the bud, it was the concealed structure of opening. In the flower, it was a region of radial organisation. In stone, it was a core or zone of formation. In relief, it was a dome, axis or source of deformation. In a nebula, it was a region of activity. In the galaxy, the centre becomes the centre of rotational cosmic organisation. This demonstrates that the same morphological term changes its content when passing between levels, but preserves its structural function: it organises a field of form.

The arms of a galaxy may be regarded as an expression of the connection between centre and periphery. They begin within, or are visually connected to, the inner regions of the disc and unfold outwards. They do not simply surround the centre, but create trajectories along which the eye interprets movement from the inner towards the outer region. Morphologically, the arm is a spiral continuation of the central organisation. It connects the nucleus, disc and periphery within a unified structure. The arms therefore function not merely as a visible pattern, but as the principal form through which the galaxy's spirality becomes legible.

Galactic arms are frequently heterogeneous. They may contain bright regions, dark dust lanes, breaks, knots, areas of enhanced luminosity, branches, secondary fragments and irregular edges. This brings them closer to actual natural structures than to an ideal mathematical spiral. A galactic arm is rarely a smooth line. It is better understood as a complex zone within which the spiral principle is realised through numerous local heterogeneities. This is highly important to the hypothesis: the Matrix should not seek ideal geometry within nature, but identify persistent formal logic amid variation.

The distribution of matter within a galaxy is another important aspect. Spiral form does not arise from empty space, but from the distribution of stars, gas, dust and luminosity. Matter may be more densely concentrated at the centre; more widely distributed across the disc; especially conspicuous within the arms; and subject to changes in density and brightness at the periphery. A galaxy is therefore not merely a geometric figure, but a field of heterogeneous distribution. Its form is the visible organisation of matter and energy on the scale of a stellar system.

Here, it is again important to establish the boundary between morphology and mechanism. Morphologically, it is possible to speak of centre, disc, arms, periphery, rotation and spiral unfolding. Mechanistically, it is necessary to consider gravity, the kinematics of the disc, distribution of mass, gas dynamics, star formation, interaction among galactic components and the history of galactic development. The hypothesis of the Matrix does not replace these mechanisms. It proposes a language through which galactic form may be compared with other forms according to structural features. The explanation of the galaxy as an astrophysical object remains the task of astronomy and cosmology.

Spiral arms may also be regarded as a cosmic variant of an active peripheral structure. At the biological level, the active edge manifested itself in a petal, leaf and growing tissue. At the geological level, it appeared in a mountain ridge, fault, slope and erosional front. At the submarine level, it appeared in a spreading lobe, fault margin and sedimentary front. In a nebula, it appeared in a boundary of gas and dust and an interaction front. In a galaxy, the arm is not so much the edge of the entire system as an active, extended zone within the disc where form becomes most legible. It connects centre and periphery, while also possessing internal edges, knots and heterogeneities of its own.

In this sense, a galactic arm may be compared not with a petal as an object, but with a line along which form unfolds. A rose petal is a surface of tissue extending from the centre of the flower towards its periphery. A galactic arm is a region in the distribution of matter that likewise leads visually from centre to periphery. The similarity is not material, but topological and morphological: an initial central region, curvilinear continuation, expansion, peripheral transition and active edge. Such a formulation preserves the analogy without erroneously biologising the galaxy.

The centre of rotation and the arms also introduce the concept of angular displacement. In simple radial opening, elements may be arranged as rays. In a galactic spiral, an arm not only moves away from the centre, but continually shifts angularly. It is this that produces the spiral trajectory. Angular displacement is likewise important within plant spirals, succulent rosettes and the arrangement of seeds and petals. It arises for different reasons within different systems, but morphologically it indicates the same type of organisation: form repeats its relationship to the centre, while each subsequent region occupies a new position.

This repetition with displacement makes galactic form particularly important to understanding the spiral cycle. A galactic arm is not a circle because it does not close at a single distance from the centre. It is not a straight line because it continually turns. It is not a chaotic cloud because it preserves an overall trajectory. It is a structure between circle and line. For precisely this reason, the galactic spiral provides a powerful image of morphogenetic development: movement repeats its relationship to the centre without returning to the same point.

Within the A–B–C–D model, galactic structure may be described provisionally. A is an initial concentration of matter or central region around which organisation may become possible. B is the emergence of rotational asymmetry, a disc or initial spiral differentiation. C is the development of arms, distribution of matter, increasing spiral structure, formation of bright and dark regions and growing complexity at the periphery. D is the observed spiral galaxy as a temporarily stable morphological form. A new A may be associated with local star-forming regions, concentrations of matter, smaller structures within the arms or future transformations of the galactic system. This scheme is not a physical model of galactic evolution, but a language of morphological description.

It is particularly important that a galaxy may contain multiple local centres within its general structure. Its arms may contain luminous knots, stellar associations, regions of gas and dust, local concentrations and star-forming regions. A galaxy is therefore not a simple system of ‘one centre — one periphery’. It possesses a large-scale centre, but local nodes of activity also exist within its arms. This brings the galaxy closer to complex self-organising systems in which centredness and polycentricity coexist. The general form is organised around a central region, while new local structures arise within it.

This coexistence of centre and multiple local nodes is important to the hypothesis of the Matrix. Within a flower, the centre is usually more clearly expressed as a unified region. Within a galaxy, the centre exists, but its arms may contain their own regions of activity. On the cosmic scale, form becomes distributed. The centre does not eliminate multiplicity, but establishes the general framework within which local centres may arise. This expands the understanding of the Matrix: universal order need not be monocentric; it may be hierarchical and multiscale.

Galactic arms may also be branching, fragmented or heterogeneous. Images of some spiral galaxies demonstrate that the arms are not always two or four ideal lines. They may divide, possess secondary branches, bridges, breaks, knots and dust lanes. Such structures are

particularly important to the relationship between spirality and fractality. The spiral establishes an overall order, while local heterogeneity creates complexity across scales. In this sense, the galaxy unites spiral and filamentary principles.

The galactic disc functions as a plane of unfolding. Just as the leaf formed a plane across which biological veins were distributed, and the ocean floor formed the hidden surface of hydrogeomorphogenesis, the galactic disc forms a cosmic plane across which matter is distributed. Once again, however, this analogy is limited. A leaf is living tissue. The ocean floor is a solid surface beneath water. A galactic disc is a distribution of stars, gas and dust within cosmic space. Only the topological relationship is shared: a relatively flat region exists within which a structure unfolds. The mechanisms remain fundamentally different.

The concept of the plane is important because a spiral requires a region within which it can unfold. The arms become visible as structures of the disc. If the distribution were entirely spherical and uniform, spiral morphology would not arise in its observed form. The disc, centre and arms therefore constitute a unified morphological triad. The centre establishes concentration, the disc provides the field of unfolding, and the arms create the spiral structure within that field. This triad may become one of the key diagrams of the chapter.

Visually, a spiral galaxy frequently appears stable and harmonious. This harmony must not conceal its complexity. A galaxy is not an ideal geometric figure, but a dynamic system. Its arms may be asymmetrical, one arm may be brighter than another, the centre may be elongated, the disc may contain a bar, the periphery may be irregular and the structure may be disrupted by interactions. A real galaxy therefore displays not the abstract perfection of the spiral, but its natural embodiment: order continually modified by history, environment and internal dynamics.

This corresponds to the general logic of the Matrix. Universal invariants should not be understood as perfectly regular figures. The centre may be displaced, the axis complex, the spiral disrupted, the arm fragmented and the edge diffuse. What matters is not absolute conformity with a geometric scheme, but the presence of a persistent morphological relationship. The spiral galaxy is valuable precisely because it demonstrates such a real invariant: the centred rotational distribution of matter with curvilinear arms and increasing peripheral complexity.

The centre of rotation and spiral arms also help explain the relationship between spiral and time. Galactic arms should not be perceived as a pattern that arose instantaneously. They are associated with the system's prolonged dynamics. On a human scale, a galaxy appears static; on a cosmic scale, it changes. Its form is therefore a moment within a prolonged process. Just as stone recorded slow geological time and the nebula the becoming of gas and dust, the galaxy records the cosmic time of rotation, distribution and the structuring of matter.

Philosophically, the galactic spiral is an image of the cycle at the largest scale. It demonstrates that the concept of return with displacement may be represented not only through plant growth or the curl of a shell, but also within cosmic architecture. This does not permit us to say that the galaxy 'grows like a plant'. It must be stated differently: galactic form demonstrates a structural motif similar to other spiral motifs—the centre remains, movement unfolds, the arms repeat a curvilinear trajectory and the periphery expands the field of form. This is the language of morphology, not biology.

The illustrations for this section should demonstrate not only the beauty of a spiral galaxy, but also its structural elements. The first illustration might be an unannotated image of a spiral galaxy in which the central region, disc, arms and periphery are clearly visible (*Fig. 7*). The second might

be an analytical diagram of the galaxy showing the centre of rotation, disc, spiral arms, dust zones, areas of luminosity and peripheral distribution (*Fig. 8*). The third might be a comparative diagram of ‘centre — arm — periphery’ using the examples of a galaxy, rose and vortex to demonstrate a shared spiral invariant while distinguishing their mechanisms (*Fig. 9*).

Illustration 8 is particularly important. It should not be merely a beautiful image of a galaxy, but a genuine diagram. It might indicate the central region, direction of rotation, arms, local nodes, dust lanes and periphery. Captions should remain minimal or be placed within the accompanying text. Such a diagram would help the reader understand that the galaxy is being analysed not as a decorative image, but as a complex morphological structure. It would also serve as a bridge to the following section, in which the cosmos will be examined as the level of ultimate scale.

Thus, the centre of rotation and the arms of a galaxy are among the most important elements at the cosmic level of the Matrix. They demonstrate that spiral form may arise as the large-scale organisation of matter around a central region. The galaxy displays centredness, rotation, disc, arms, heterogeneity, periphery and local nodes of activity. All these features may be incorporated into the language of morphological invariants, provided they are not conflated with biological or geological mechanisms.

The principal conclusion of the section is that a spiral galaxy is not a literal ‘cosmic rose’, but an independent astrophysical system within which visible form is organised through a centre of rotation, disc and arms. Its significance to the hypothesis of the Unified Matrix of the Universe lies in its demonstration of one of the largest-scale variants of radial-spiral unfolding: the centre concentrates, rotation organises, the arms connect the inner region with the periphery, and the distribution of matter becomes a persistently recognisable cosmic form.

16.4. Space as a Level of Ultimate Scale

For the hypothesis of the Unified Matrix of the Universe, the cosmic level is the level of ultimate scale. Biological forms are accessible to direct observation; a stone may be held in the hand; mountain relief may be observed as part of the Earth’s surface; and the ocean floor may be reconstructed through bathymetry. A galaxy, however, carries the analysis of form beyond ordinary human experience. Here, the object is a structure whose dimensions are measured across immense distances, whose existence exceeds the span of human history and whose observation is possible only through complex optical, radio and digital technologies. Space therefore does not merely add another type of form; it changes the scale of thought about form itself.

In the preceding chapters, the book moved from near to distant, visible to concealed, living to non-living and terrestrial to cosmic. The flower provided a local model of morphogenesis: bud, centre, petal, opening, edge, fruit and seed. The leaf demonstrated a plane of unfolding and a distribution network. The fern and succulent demonstrated self-similarity, fractality and layered centredness. Stone revealed the slow memory of matter, layers, folds, veins and the stabilisation of time. Mountain relief demonstrated a surface of morphogenesis upon which pressure, erosion, faulting, valley and edge create terrestrial form. The ocean floor introduced a hidden hydrogeomorphology: domes, ruptures, spreading, sedimentary surfaces and dual opening through natural processes and scientific visualisation. Nebulae revealed cosmic cloud morphogenesis: gas, dust, radiation, centre, periphery, active edge, ejection and rupture.

Galaxies complete this transition as structures within which centre, rotation, spiral arms and the distribution of matter become visible on the scale of stellar systems.

Space as a level of ultimate scale is important not because it ‘proves’ all the preceding levels, but because it expands the field within which morphological language may be applied. If similar relationships of form are found within biology, geology, hydrogeomorphology and astrophysics, there are grounds for describing the Matrix as a metatheoretical language of invariants. These grounds must, however, be understood cautiously. A galaxy cannot be explained through a flower, just as a flower cannot be explained through a galaxy. A stone is not a miniature nebula, and a nebula is not a living organism. What may be shared is not the mechanism, but a mode of organising visible or reconstructable form: centre, edge, layer, axis, spiral, lobe, rupture, flow, opening, fractal heterogeneity and transition from the hidden to the manifest.

The cosmic scale demonstrates the boundary between analogy and explanation with particular clarity. When a spiral galaxy is compared with a rose, the comparison must not become an assertion that the galaxy is biological. When a nebula is compared with a flower, this does not mean that space literally ‘flowers’. When a galactic arm is compared with a petal, this does not make it an organ. All these comparisons are permissible only at the level of morphological invariants. This constitutes the mature position of the hypothesis: it does not erase the distinctions among sciences, but proposes a language through which structural relationships may be compared across them.

Space is also the ultimate scale because form is almost entirely mediated through observation. A flower may be examined with the eyes. A stone may be cut and studied. Mountain relief may be observed directly or through a map. The ocean floor already requires technological reconstruction through sonar, bathymetry and geophysics. Space requires still greater mediation: telescopes, different spectral ranges, long exposures, digital processing, representational colours, models and data interpretation. Cosmic form is therefore presented to human beings not only as a natural object, but also as a scientifically produced image. This does not make it unreliable, but requires particular discipline in its interpretation.

The visual beauty of galaxies and nebulae may be exceptionally powerful. It readily evokes associations with flowers, roses, vortices, eyes, fabrics, roots, trees and waves. The scientific-philosophical purpose of the study is not, however, to intensify these associations for emotional effect. Its purpose is to determine which structural relationships may genuinely be identified. In the case of space, it is particularly important to distinguish three levels: visual image, morphological invariant and physical mechanism. The visual image may resemble a terrestrial form. The morphological invariant may be comparable. The physical mechanism must be examined separately and must not be replaced by the resemblance between images.

It is precisely the cosmic level that compels the definitive rejection of the naïve idea that the Matrix is a simple scheme of identical forms. If the Matrix meant that all objects literally repeated the same pattern, cosmic material would immediately reveal the limitations of this approach. Nebulae, galaxies, stellar clouds and cosmic webs are too diverse, too immense and too physically specific to be reduced to a single image. If, however, the Matrix is understood as a language of recurrent relationships—centredness, unfolding, spirality, activity at the edge, rupture, self-organisation and multiscale heterogeneity—space becomes not a problem, but one of the most powerful fields in which the hypothesis may be tested and refined.

Galactic structure is particularly important in this respect. It possesses a centre, disc, arms, periphery, rotation and heterogeneous distribution of matter. These elements are neither living

organs nor geological layers. They nevertheless form a complex and persistently recognisable morphology. The galaxy demonstrates that form may exist as the distribution of immense numbers of objects and media: stars, gas, dust, star-forming regions, dark lanes and luminous zones. It is the form not of a single body, but of an entire system. Space thereby expands the concept of morphogenesis from body to ensemble, from object to field and from surface to distribution.

At the biological level, morphogenesis is frequently associated with the growth of an organism. At the geological level, it is associated with pressure, deformation, destruction, accumulation and time. At the hydrogeomorphological level, it is associated with water, faults, flows, sediment and concealed surfaces. At the cosmic level, it is associated with gravity, rotation, gas, dust, radiation, stellar activity and the distribution of matter through space. These are different types of morphogenesis. They cannot be reduced to a single physical formula. They may, however, be compared as different modes of the becoming of form. This is precisely what makes the study metamorphological rather than narrowly biological or astrophysical.

Space as the ultimate scale also demonstrates that form may exist without a solid boundary. A galaxy possesses an observed periphery, but its edge is not a sharp line. A nebula possesses luminous and dark contours, but these are gradients of density, radiation and dust. Cosmic form frequently exists as a distribution rather than a shell. This requires an expansion of the concept of form: form may be not only bodily, but field-like; not only superficial, but volumetric; not only materially dense, but diffuse; and not only defined by a contour, but by relationships among density, luminosity and movement.

This expansion is important to the entire hypothesis of the Matrix. At the beginning of the study, form might have been perceived as a contour, body or visible structure. It gradually became clear that form is the organisation of a process. In the flower, it is the organisation of growth and opening. In stone, it is the organisation of time and matter. In relief, it is the organisation of surface and destruction. On the ocean floor, it is the organisation of a concealed boundary between the lithosphere and hydrosphere. In a nebula, it is the organisation of gas, dust, light and energy. In a galaxy, it is the organisation of a rotating distribution of matter. Space completes this transition: form can no longer be reduced to appearance, but must be understood as a stable configuration of relationships.

The cosmic level also demonstrates the ultimate role of time. A flower exists within biological time. Stone preserves geological time. Relief develops within deep terrestrial time. The ocean floor is renewed, covered and destroyed within planetary cycles. Nebulae and galaxies exist within cosmic time. Their light reaches the observer after a delay. Their form is not only spatial, but historical. We do not observe the absolute ‘present’ of space, but an image of a past state that has reached us. Cosmic form is therefore always a form of time.

This circumstance makes galaxies especially significant philosophically. A spiral galaxy appears to be a majestic and stable object, but it is a dynamic system existing within a prolonged history. Its arms, centre, disc, star-forming regions and periphery are not immobile elements. They participate in movement and change. Within human perception, the galaxy is almost motionless. Within cosmic reality, it changes. Galactic form is therefore an example of temporal stabilisation: movement occurs across such immense scales and durations that it becomes an image of order to the observer.

Such temporal stabilisation has already appeared in stone. Stone seemed immobile, but preserved traces of pressure, crystallisation, fissuring and mineralisation. Mountain relief

appeared stable, but resulted from uplift, erosion and destruction. The ocean floor appeared to be a concealed foundation, but was an active surface of processes. The galaxy appears as a cosmic ornament, but is a dynamic system. In each case, form is the visible or reconstructable result of a process. Space merely carries this idea to its ultimate scale.

Galactic and spiral structures also demonstrate that scale does not destroy an invariant, but changes its content. The centre of a flower and the centre of a galaxy are not the same. A galactic arm and rose petal are not the same. The spiral of a shell and the spiral of a galaxy are not the same. The relationship 'centre — rotational unfolding — periphery' may nevertheless be compared. An invariant is therefore not an unchanging object, but a persistent relationship that acquires different material content at different levels. This is one of the principal theoretical propositions of the entire study.

Space as the level of ultimate scale also returns us to the problem of self-organisation. In biology, self-organisation manifested itself through growth, tissue differentiation and morphogenesis. In geology, it manifested itself through interactions among physical processes, pressure, fractures, flows and time. In space, self-organisation manifests itself through gravitational, gas-dynamic, radiative and rotational processes. A galaxy is not assembled like a mechanism by an external maker. Its form arises through interactions among its components and forces. This makes space an essential example of self-organising structure at the macrolevel.

The term 'self-organisation' also requires caution here. It does not imply an absence of physical laws and causes. On the contrary, self-organisation means that order arises through interactions among the elements of a system under particular conditions. Within a galaxy, this involves the interaction of matter, gravity, rotation, gas, dust, stellar evolution and the environment. Within a nebula, it involves interactions among gas, dust, radiation and stellar activity. Self-organisation is not a mystical and spontaneous miracle. It is a mode through which structure emerges within a complex system.

The cosmic scale also reveals the connection between spirality and fractality. Galactic arms may contain local heterogeneities, clouds, stellar regions, dust structures and filaments. Nebulae may possess fractal-like edges and nested cloud forms. Cosmic matter is frequently distributed unevenly, and this heterogeneity may manifest itself at different scales. Excessive assertions must once again be avoided. Not every cosmic structure is a strict fractal. It is more accurate to speak of multiscale heterogeneity, filamentation, hierarchy and natural self-similarity where this is visually and scientifically justified.

The galaxy as a cosmic object also demonstrates that the Matrix must encompass not only forms of opening, but also forms of rotation. Until this point, opening has been a principal motif: the bud opens, the leaf unfolds, stone exposes its layers, relief is dissected by valleys, the ocean floor is revealed through faulting and bathymetry, and the nebula expands and ejects matter. Within the galaxy, another motif predominates—the rotational distribution of matter. This does not eliminate opening, but makes it more complex. Here, cosmic form does not simply open outwards; it unfolds around a centre.

In this sense, the present chapter completes not only the transition towards the macroscale, but also the expansion of the morphogenetic vocabulary. Spiral is added to the existing categories—seed, centre, layer, edge, axis, fold, rupture, lobe, flow and opening—as a category of cyclical-progressive movement. The spiral makes it possible to describe forms in which repetition is connected with a change of scale and return with transition to a new level. It becomes a

connecting concept among biological growth, vortical processes, atmospheric dynamics, galactic arms and fractal images.

Space as the ultimate scale also helps us reconsider smaller forms. After the galaxy, the rose is perceived differently. It ceases to be merely a beautiful flower and becomes a local biological realisation of centre, layer, spirality and opening. After the nebula, the petal is perceived not only as a floral organ, but as one form of active periphery. After the galactic spiral, a succulent rosette or shell becomes part of a broader sequence of spiral structures. Space does not invalidate terrestrial forms, but expands the context within which they are understood.

This retrospective view also requires caution. It cannot be said that the rose is 'explained' by the galaxy or that the succulent literally 'repeats' the cosmos. Rather, cosmic scale demonstrates that familiar terrestrial forms may be incorporated into a broader morphological sequence. This changes not their nature, but our understanding of their place within the general grammar of form. The rose remains a rose and the galaxy remains a galaxy. A shared invariant of radial-spiral unfolding may nevertheless be identified between them.

The cosmic level should therefore not be treated as a conclusion in the sense of completing the proof. It is an expansion of perspective. It demonstrates that the hypothesis of the Matrix may operate not only through material from living nature and terrestrial geology, but also through astrophysical formations. Every step in such an expansion must, however, be accompanied by methodological control. The farther a scale lies from human experience, the greater the role of scientific mediation, the higher the risk of visual illusion and the more cautious the conclusions must become. Space demands the greatest intellectual discipline.

Several concluding propositions may be identified within Chapter 16. First, the spiral is one of the most powerful universal motifs of form because it unites centre, movement, repetition, displacement and expansion. Second, the 'rose — galaxy' pairing is permissible only as a morphological analogy of radial-spiral unfolding. Third, galactic structure must be analysed through its centre of rotation, disc, arms, distribution of matter and periphery rather than through biological metaphors. Fourth, space is the level of ultimate scale at which the Matrix manifests itself as a language for organising immense dynamic systems rather than as a simple repetition of terrestrial objects.

The cosmic scale also demonstrates that form may be simultaneously local and global. Locally, galactic arms contain star-forming regions, clouds of gas and dust, star clusters and nebulae. Globally, all these are incorporated into the structure of the galaxy. Small morphogenetic processes exist within the larger spiral invariant. This creates nested levels: a nebula within a galaxy, a star within a nebula, planetary systems around stars and biological forms on planets. Such nesting does not prove a linear hierarchy of the Matrix, but demonstrates that forms may be included within one another according to scale.

This nesting is particularly important to the philosophy of form. Understood in this way, the Matrix is not a flat scheme. It does not claim that all forms are identical. It demonstrates that different levels may contain forms of their own while simultaneously forming part of larger forms. A leaf is part of a plant; a plant, part of an ecosystem; a stone, part of a geological cycle; relief, part of the planetary surface; the ocean floor, part of the Earth; a nebula, part of the galactic environment; and a galaxy, part of a larger cosmic structure. Form exists as a nesting of relationships.

Space as the ultimate scale also intensifies the question of the limits of the hypothesis. The hypothesis of the Unified Matrix of the Universe must not claim more than its methodology can

sustain. It must not become an assertion of a single mystical mechanism underlying every form. It must not replace biology, geology, oceanography or astrophysics. Its strength lies elsewhere: in identifying recurrent morphological relationships and creating a language through which forms may be compared without destroying their differences. Space tests this strength. If the language of the Matrix withstands the cosmic scale, it becomes more convincing as a metatheoretical scheme.

From this perspective, the present chapter possesses a concluding significance for the cosmic part as a whole. The preceding chapter presented nebulae as cloudy, non-equilibrium forms of cosmic morphogenesis composed of gas and dust. The present chapter presents galaxies as spiral, centred, rotational and distributive structures. Together, they provide two different images of cosmic form: cloud-like opening and spiral rotation. The first is associated with nebulae, ejections, edges, cavities and filaments. The second is associated with galactic centres, discs, arms and peripheries. Both levels are important to the Matrix, but they must not be conflated.

The illustrations should demonstrate the transition of scale. The first might present the sequence ‘flower — shell — vortex — nebula — spiral galaxy’ as a morphological series of spirality and centred unfolding (*Fig. 10*). The second might be a diagram of the scales of the Matrix: biological, geological, hydrogeomorphological and cosmic, with each level possessing its own mechanisms but comparable invariants (*Fig. 11*). The third might be a concluding diagram for the chapter: centre, rotation, arms, periphery, local nodes and the large-scale self-organisation of the galaxy (*Fig. 12*). These images should complete not only the chapter, but also the entire transition from terrestrial to cosmic form.

The diagram of scales is especially important. It should demonstrate that the hypothesis of the Matrix does not reduce every level to a single object, but arranges them as different modes of morphogenesis. In biology: growth and opening. In geology: pressure, layer, rupture and time. In hydrogeomorphology: water, flow, rupture and sediment. In nebulae: gas, dust, radiation and ejection. In galaxies: gravity, rotation, disc and arms. The shared invariants—centre, edge, layer, spiral, flow, rupture and periphery—may be indicated between them. Such a diagram would be especially useful to the concluding interpretation of the cosmic part.

Thus, space as a level of ultimate scale completes the transition from local biological and geological forms to the macroscale structures of the Universe. It demonstrates that morphological invariants may be identified not only within the flower, leaf, stone, relief and ocean floor, but also within nebulae and galaxies. This transition, however, requires the greatest caution: cosmic forms cannot be explained through biological metaphors, and visual resemblance cannot be accepted as physical identity. Galaxies, nebulae, flowers and stones differ in matter, scale, time and mechanism. They may nevertheless be compared through the language of form.

Spiral and galactic structures demonstrate one of the largest-scale variants of the Matrix: the centred rotational unfolding of matter through space. The spiral unites repetition and development, centre and periphery, cycle and progressive movement, the memory of form and transition to a new level. Within the galaxy, this principle manifests itself through the centre, disc, arms and distribution of matter. At the cosmic level, the Matrix becomes a language of ultimate scale: not a literal repetition of terrestrial forms, but a system of morphological invariants that makes it possible to think about the unity of form without erasing the differences among processes.

Fig. 1. Spiral as a Morphological Motif: Shell, Plant, Vortex, and Galaxy despite Differences in the Mechanisms of Formation

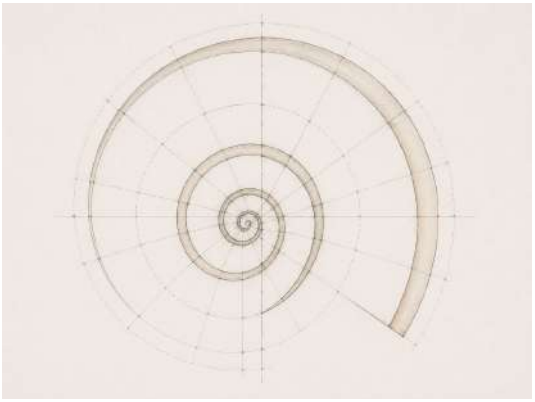

Fig. 2. Geometrical Structure of the Spiral: Centre, Coil, Radial Expansion, Pitch, and Periphery

Fig. 3. Types of Spiral Organisation: Biological Growth, Flow, Atmospheric Rotation, Galactic Dynamics, and Mathematical Iteration

Fig. 4. Rose and Spiral Galaxy as a Visual Pair of Radial-Spiral Unfolding despite Differences in Mechanism

Fig. 5. General Morphological Invariant: Centre, Spiral Displacement, and Peripheral Unfolding

Fig. 6. Limits of Analogy: the Biological Unfolding of the Rose and the Astrophysical Dynamics of the Galactic Disc

Fig. 7. Spiral Galaxy: Central Region, Disc, Arms, and Peripheral Distribution of Matter

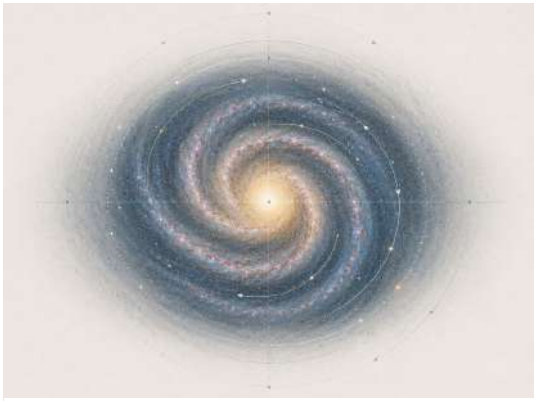

Fig. 8. Centre of Rotation and Arms as the Morphological Structure of the Galactic Disc

Fig. 9. General Spiral Invariant: Centre, Curvilinear Unfolding, and Periphery in the Galaxy, the Rose, and the Vortex

Fig. 10. Transition of Scale: from Biological Spirals to Galactic Structures despite Differences in Mechanism

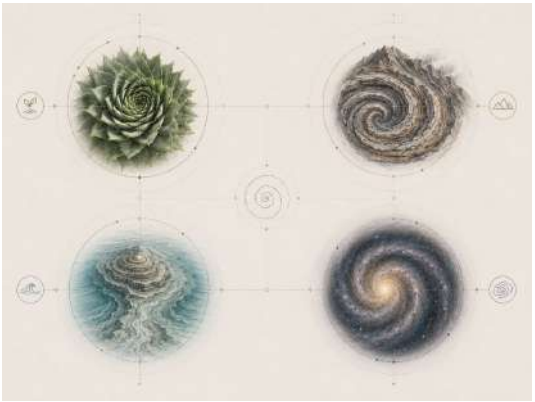

Fig. 11. Levels of the Matrix: Biological, Geological, Hydrogeomorphological, and Cosmic Regimes of Morphogenesis

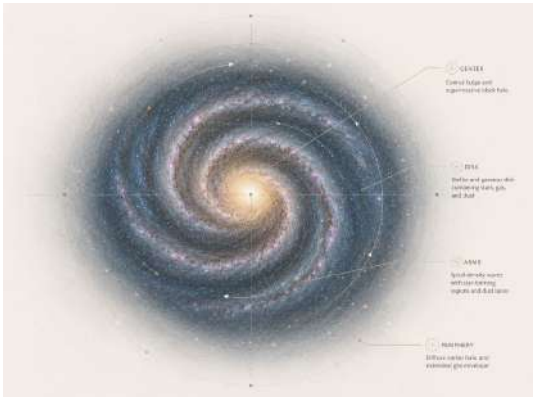

Fig. 12. Galaxy as the Ultimate Scale of Spiral Self-Organisation: Centre, Disc, Arms, and Periphery

Chapter Seventeen

BIO–GEO–COS: Comparative Morphology Across Levels

17.1. The Method of Visual Triads

Following the examination of the biological, geological and cosmic levels of the Matrix, it becomes necessary to move from the sequential description of individual domains to their comparison. Until this point, the book has progressed through successive levels. First, it analysed living forms—the seed, flower, leaf, fruit, succulent and fern; then geological structures—stone, fold, relief, valley and ocean floor; and finally cosmic formations—nebulae, shells, ejections, and galactic and spiral structures. This order was necessary to prevent different types of matter from being conflated and specific mechanisms from being replaced with a general metaphor. The hypothesis of the Unified Matrix of the Universe cannot, however, be limited to the separate description of levels. Its central question is precisely whether recurrent morphogenetic invariants exist that manifest themselves within different environments and scales, preserving structural comparability rather than causal identity.

To address this question, the present chapter proposes the BIO–GEO–COS method of visual triads. A visual triad is understood as the comparison of three objects belonging to three different levels in the organisation of matter: biological, geological and cosmic. The first object is drawn from living nature, the second from the terrestrial geological or geomorphological environment, and the third from the cosmic scale. A flower, for example, may be compared with mountain or submarine relief and a nebula; a leaf, with a valley and cosmic shell; and a bud, with a stone structure and planetary form. The comparison is based not on an assertion that these objects possess the same origin, but on an analysis of which morphological features recur within them.

Such a method is necessary because a simple pairwise analogy is frequently too weak and too vulnerable. If only a flower and nebula are compared, there is a risk that the result will remain an artistic impression: they may appear similar because of their radiality, brightness, open periphery or multilayered structure, but this resemblance may easily be dismissed as subjective. If only a leaf and valley are compared, a shared axis and lateral branching may be observed, but it may likewise be argued that this is merely an accidental resemblance connected with the human tendency to perceive familiar images. The triad makes the comparison more rigorous. It introduces a third level that prevents the analogy from being reduced to the simple resemblance between two pictures. If the same structural motif manifests itself within three different environments—living, geological and cosmic—it acquires greater methodological weight as a possible morphological invariant.

This weight nevertheless remains methodological rather than conclusively evidential. A visual triad does not in itself prove the existence of the Unified Matrix of the Universe. It performs another function: it helps identify features that may subsequently be described, classified, measured and tested. In other words, the triad is not evidence, but a tool for formulating a research question. It translates an impression of resemblance into a more disciplined analysis of

form. Where one might previously have said, ‘These objects resemble one another’, the visual-triad method requires a more precise statement: ‘Centredness, radiality, layering, an active edge, branching or stages of opening recur within these objects; these features may consequently be regarded as possible invariants of comparative morphology.’

The principal advantage of the visual-triad method is that it preserves the distinctions among levels. A biological object does not become geological, a geological object does not become cosmic, and a cosmic object does not become biological. A flower remains the result of biological morphogenesis associated with tissue growth, genetic regulation, biomechanics, reproductive function and the plant’s interaction with its environment. Relief remains the result of geological processes: tectonic pressure, erosion, sedimentation, folding, faulting, and the movement of water, ice or submarine currents. A nebula remains a cosmic structure arising under the influence of gravity, radiation, gas dynamics, shock waves, turbulence, magnetic fields and star-forming processes. The triadic method does not erase these distinctions, but makes them a condition of valid comparison.

A visual triad should therefore be constructed along two parallel lines.

The first is the differentiating line. It records the mechanisms underlying each form, the scale to which the form belongs, the environment within which it exists, the temporal regime within which it develops and the manner in which it maintains stability.

The second is the comparative line. It identifies which structural features recur despite differences among mechanisms.

Only the simultaneous operation of these two lines makes it possible to avoid methodological error. If only the differentiating line is retained, the very concept of comparative morphology becomes impossible. If only the comparative line is retained, the hypothesis degenerates into unrestricted analogising. The visual-triad method must maintain both lines simultaneously.

In this sense, the triad is not simply a sequence of images, but an analytical construction. It must contain at least three elements: object, feature and level. The object answers the question: what precisely is being compared? The feature answers the question: on what morphological basis is the comparison being made? The level answers the question: within which system, and through which processes, is the feature realised? If the triad ‘flower — relief — nebula’ is being considered, for example, the objects are a specific floral form, a specific relief structure and a specific nebula. The features may include centre, radiality, layering, an undulating edge and opening. The levels are biological morphogenesis, geomorphological form-generation and the cosmic dynamics of gas and dust. Only through this threefold clarification does the comparison cease to be arbitrary.

The visual-triad method assumes that every object must first be described autonomously and only then comparatively. This is fundamental. It is not permissible to begin with a general resemblance and adjust the details to fit it. Each object must first be examined according to its own logic. In a flower, it is necessary to identify the centre, axis, arrangement of petals, character of radiality, degree of opening, structure of the edge and connection with the bud and fruit. In relief, it is necessary to identify the direction of valleys, lines of folds, areas of uplift and subsidence, faults, layers, edge forms, and traces of erosion or tectonic stress. In a nebula, it is necessary to identify the region of concentration, shells, filaments, zones of light and density, ruptures, ejections, periphery and the character of expansion or dispersal. Only after such an

autonomous description may the comparative question be asked: which of these features genuinely recur, and which result from a superficial impression?

A visual triad should consequently possess a feature matrix. Such a matrix records centre, axis, symmetry and asymmetry, layering, radiality, branching, spirality, the character of the edge, self-similarity, degree of opening, the presence of internal stress, the relationship between closed and open form, and a possible stage within the A–B–C–D model. Not every object is required to contain every feature. Such a requirement would be artificial and methodologically suspect. The seriousness of the analysis is demonstrated, on the contrary, when the researcher records not only correspondences, but also absences. If one object possesses pronounced radiality but no clear axis, this must be noted. If another object possesses layering but no centre, this is likewise significant. If a third possesses a complex edge but demonstrates no stages of opening, it cannot be forced into the scheme. The triadic method requires not that the hypothesis be confirmed at any cost, but that the precise conditions under which it operates—and those under which it requires limitation—be established.

The concept of the morphological invariant plays a distinctive role within the visual-triad method. Here, an invariant does not mean an identical detail or mechanism. It means a recurrent structural principle. A centre may be the heart of a flower, a zone of uplift or depression within relief, or a luminous region of a nebula. In all three cases, however, the centre performs a comparable morphological function: it organises the space of form, establishes the relationship between interior and exterior, and concentrates a process or compositional tension. An axis may be a stem, midrib, valley line, fault direction, vector of ejection or axis of symmetry within a cosmic shell. Layering may be petal-based, sedimentary, folded, shell-like or composed of gas and dust. An edge may be the edge of a petal, serrated line of a ridge, shoreline, boundary of a cloud structure or periphery of a nebula. In every case, the material and mechanism differ, but the structural role of the feature may be comparable.

A fundamental methodological requirement is the distinction among three types of resemblance.

1. External resemblance is registered visually and may be aesthetically persuasive, but is insufficient in itself.
2. Structural resemblance is based on the recurrence of particular relationships: centre—periphery, axis—lateral branches, layer—layer, core—shell, and closed form—opened form.
3. Processual resemblance concerns not only form as a result, but also the proposed logic of its becoming: concentration, symmetry breaking, differentiation, opening, branching, rupture, stabilisation and transition to a new state.

The second and third types of resemblance are the most important to the hypothesis of the Unified Matrix of the Universe. External resemblance may provide a point of departure, but research significance emerges only when structural or processual recurrence is identified behind it.

A visual triad should therefore be analysed not as a static composition, but as a trace of process. The flower is important not only because it is open, but also because it was once a bud and is connected with a future fruit. Relief is important not only because of its present pattern, but because it records a history of pressure, erosion, folding, faulting and the movement of matter. A nebula is important not only because of the image obtained through a telescope, but because its form represents a moment within a cosmic process: concentration, expansion, ejection, dispersal, star formation or destruction. If the objects are treated solely as pictures, the method

remains weak. If they are interpreted as forms bearing the memory of becoming, the triad becomes an instrument of morphogenetic analysis.

The problem of scale must also be taken into account. A biological form exists on scales of millimetres, centimetres or metres and develops over hours, days, months, years or generations. A geological form may occupy metres, kilometres or entire regions and develop over thousands, millions or hundreds of millions of years. A cosmic form may extend over light-years and exist on scales inaccessible to direct human perception. BIO–GEO–COS comparison therefore does not equate scales. It does not claim that a leaf, valley and cosmic shell are objects of the same order. It proposes only that comparable morphological relationships may manifest themselves at different scales. Scale changes, matter changes and mechanism changes, but certain structural solutions may recur.

This circumstance makes the visual-triad method especially important to the transition from a figurative hypothesis to a research programme. While the discussion remains confined to an impression, scientific criticism may legitimately ask: Why were these particular images selected? Is the selection subjective? Have only objects confirming a predetermined idea been chosen? The triadic method must answer these questions procedurally. The features according to which comparisons will be made must be defined in advance. Both successful and borderline cases must be included. The degree to which a feature is expressed must be recorded, rather than merely its presence. Strong triads, in which a complex of features recurs, must be distinguished from weak triads, in which only one external motif coincides. In the future, this could form the basis of morphometric and statistical analysis.

A visual triad may be regarded as strong when several conditions are satisfied.

First, the resemblance concerns not one external feature, but a group of structural features.

Second, these features possess functional or processual significance within each system.

Third, the differences among the objects are not concealed, but explicitly described.

Fourth, the comparison permits further formalisation: the contour may be measured, symmetry evaluated, branching classified, layering described, fractal dimension calculated and the degree of radiality determined.

A triad should be regarded as weak when its objects merely resemble one another externally without demonstrating a persistent system of morphological features. This distinction is necessary to prevent the method from becoming an unrestricted play of images.

It should also be emphasised that a visual triad does not eliminate disciplinary knowledge. On the contrary, it requires such knowledge. A valid analysis of a flower requires an understanding of the foundations of biological morphogenesis and botanical structure. An analysis of relief requires knowledge of geomorphology, tectonics, erosional processes, sedimentation and lithomorphogenesis. An analysis of a nebula or galactic shell requires knowledge of astrophysics, gas dynamics, gravitational structuring, star-forming processes and cosmic expansion. If the researcher disregards these disciplinary explanations, there is a risk that external form will be mistaken for independent evidence. The visual-triad method must therefore be interdisciplinary not only in its objects, but also in its responsibility towards the individual sciences.

In this sense, the BIO–GEO–COS method may be regarded as an intermediate level between a philosophical hypothesis and future empirical testing. The philosophical hypothesis formulates a general question about the recurrence of form. The visual triad makes it possible to identify

specific morphological features. Morphometrics and statistics may subsequently test how persistent those features are, how frequently they occur, in which combinations they manifest themselves and whether they differ from random distribution. The triad consequently occupies an intermediate position. It is not yet rigorous evidence, but it is no longer a simple metaphor. It transforms the intuition of form into a working analytical unit.

It is particularly important that the visual-triad method makes it possible to identify not only individual features, but also their combinations. A centre rarely exists in isolation. It is usually associated with radiality, layers, a periphery, axis or shell. An axis is frequently associated with lateral branching, the direction of growth, a valley, flow or ejection. Layering is associated with the memory of stages, accumulation, opening or a sequence of waves. An edge is associated with interaction between a system and its environment. Spirality is associated with growth through displacement and repetition. The object of analysis is therefore not an isolated feature, but a morphological complex. It is the complex of features that may provide a more reliable basis for comparison among levels than a single resemblance.

This approach changes the very status of the image within the book. The image ceases to be an illustration in the decorative sense. It becomes a visual document of form. It displays a structure that must subsequently be interpreted, described and compared. Such interpretation must, however, remain disciplined. One cannot see whatever one wishes within an image. The same questions must be asked of every object: Where is the centre? Is there an axis? How is the periphery organised? Is layering expressed? Is branching present? How is the edge structured? Is it possible to speak of radiality or spirality? Is a stage of opening visible? Is there a trace of internal stress? How is the form connected with its environment? Which features are strongly expressed and which remain doubtful? Only the repeated application of the same questions transforms a visual sequence into a method.

The visual-triad method also helps overcome the danger of anthropomorphic and aesthetic perceptions of nature. Human beings tend to perceive familiar images: a face in a cloud, flower in a nebula, tree in lightning, river in a vascular network or rose in a galaxy. This perceptual capacity may be a source of discovery, but also a source of error. In the present book, visual impression is therefore recognised only as the first step. It initiates a question, but does not answer it. It is then necessary to determine whether a recurrent structure genuinely lies behind the impression. The triadic method introduces precisely this filter: it demands a transition from ‘these resemble one another’ to ‘which features recur?’, from image to description and from description to possible testing.

An important consequence of the method is the possibility of constructing an atlas of morphogenetic triads. Such an atlas might eventually include series of images grouped according to their principal invariants: radial triads, axial triads, branching triads, layered triads, spiral triads, shell-like triads, triads of closed form and triads of opening. Within each group, arrays of objects rather than individual examples could be compared. The hypothesis would then acquire more rigorous material: not an isolated and striking analogy, but a series of observations organised according to a shared principle of features. This is especially important to the scientific prospects of the study, since such an atlas and classifier could provide the foundation for future testing.

The limitations of the method must, however, already be acknowledged.

First, a visual triad depends upon the quality and viewing angle of the image. The same object may appear differently according to scale, lighting, processing, observational angle or method of visualisation.

Second, many cosmic images result from complex instrumental processing, colour coding and data interpretation. They cannot be regarded as direct photographs in the everyday sense.

Third, geological relief may appear differently on a map, satellite image, digital elevation model or field photograph.

Fourth, a biological form changes according to its developmental stage.

The triadic method consequently requires careful treatment of visual material and an explicit indication of the particular aspect of form being analysed.

In addition, the triad must not be isolated from negative cases. If a researcher selects only flowers, relief structures and nebulae that correspond attractively, the result is not a scientific method but a confirmatory collection. Serious research must also include objects in which the expected invariant is weakly expressed, disrupted or absent. This will make it possible to establish the limits within which the hypothesis applies. Not every flower, for example, demonstrates strong radiality; not every relief possesses a pronounced axis; not every nebula possesses a clear centre; and not every stone structure may be compared with a bud. Acknowledging such cases does not destroy the hypothesis, but makes it more scientific by demonstrating a readiness to distinguish the domain in which the model operates from that in which it does not.

The visual-triad method must also take account of the fact that the same object may enter different triads depending upon the principal feature being analysed. A flower may be incorporated into a radial triad when the analysis concerns opening from centre to periphery. The same flower may form part of a layered triad if attention focuses upon petals as former layers of the bud. A leaf may enter an axial triad through its midrib and lateral branching, or a fractal triad through the repeated pattern of its veins. A stone may be considered as a closed form, layered structure, memory of pressure or object containing internal stress. Such polysemy is not a defect, provided the feature serving as the basis of comparison is clearly identified on every occasion.

The BIO–GEO–COS visual-triad method consequently makes it possible to construct a more rigorous language of comparative morphology. It enables comparisons among biological, geological and cosmic levels without conflating them. It demonstrates that the hypothesis of the Unified Matrix of the Universe should seek not the external identity of objects, but the recurrence of structural relationships. It introduces a procedure: autonomous description of the object, identification of features, comparison across three levels, recording of correspondences and differences, evaluation of the strength of the triad and preparation for further formalisation. Visual material thereby ceases to be an ornament to the study and becomes a research instrument.

The comparative part of the chapter should begin with precisely such a method. The following sections will examine specific triads: flower—relief—nebula; leaf—valley—cosmic shell; and bud—stone—planetary structure. Each will test a particular set of invariants. The first triad focuses upon layering, edge, radiality and opening. The second focuses upon axis, lateral branching and recurrent boundaries. The third focuses upon closed form, internal stress and gradual opening. None of these comparisons should be interpreted as proof of the ultimate unity

of all forms, but as a sequential attempt to identify morphological features that may provide a basis for future rigorous analysis.

Thus, the visual-triad method constitutes a key transition from the descriptive part of the study to comparative morphology. It makes it possible to preserve scientific caution without abandoning the central question of the hypothesis: why do similar structural solutions arise at different levels of matter? This question cannot be answered through a single image or analogy. It may, however, be prepared through a system of comparisons within which every level preserves its specificity and recurrent features are gradually identified as possible elements of a universal morphogenetic logic. This is the methodological significance of the BIO–GEO–COS triads: they do not prove the Matrix directly, but create a language within which it may be discussed seriously, testably and without mystification.

17.2. The ‘Flower—Relief—Nebula’ Triad

The ‘flower—relief—nebula’ triad is one of the central triads within the hypothesis of the Unified Matrix of the Universe because it brings together the three levels of comparative morphology—biological, geological and cosmic—with particular clarity. This triad immediately demonstrates both the strength and the risk of the entire approach. On the one hand, a flower, relief and nebula may genuinely display similar structural features: a centre, radiality, layering, an active periphery, scalloped or undulating edges, and a transition from an inner core to an opened external form. On the other hand, the danger of superficial analogy is especially great here. A flower is not a ‘small nebula’, a nebula is not a ‘cosmic flower’, and relief is not an intermediate stage between them. They cannot be connected through poetic resemblance. They may be compared only through rigorously identified morphological features.

The ‘flower—relief—nebula’ triad should therefore be regarded as a test of the visual-triad method. When applied correctly, the method does not replace biology, geology and astrophysics with a general metaphor, but makes it possible to identify structural relationships that recur within different environments. A flower forms through biological morphogenesis, tissue growth, genetic regulation, the distribution of cellular stresses, the opening of a bud, reproductive function and the plant’s interaction with its environment. Relief forms through tectonic movements, erosion, folding, sedimentary processes, faulting, rock resistance and the action of water, wind, ice or submarine currents. A nebula arises within the cosmic environment through gas dynamics, gravity, radiation, shock waves, turbulence, star formation, expansion or destruction. Their mechanisms differ. It is precisely in view of these differences that it becomes important to determine whether particular organisational invariants recur within their forms.

The principal features within this triad are layering, edge, radiality and opening. These features have not been grouped arbitrarily. They constitute a morphological complex. Layering demonstrates that form is created not as an instantaneous surface, but as a sequence of levels, shells, petals, folds or regions of gas and dust. The edge indicates the region in which form interacts with its environment and the site of maximum morphological activity and stress. Radiality indicates the propagation of structure from centre to periphery. Opening connects all these features within a process: a closed or concentrated state passes into a more open, articulated and spatially expressed form. Together, these features make it possible to analyse the

triad not as a collection of similar images, but as the recurrence of a particular scenario of form-generation.

Within this triad, the flower is the initial biological model of opening. Its significance lies not in its beauty or visual persuasiveness, but in the particular clarity with which it expresses the process of morphogenesis. A flower possesses a centre around which its petals, stamens, pistil, ovary and other elements are organised. It possesses an axis connected with the stem and direction of growth. It demonstrates radiality or, in certain cases, modified symmetry. It possesses layering because the opened flower carries the memory of the bud: its petals were arranged in layers, protected the inner region and gradually diverged to expose the centre. Its edge—the edge of the petal—is frequently undulating, serrated, scalloped, asymmetrical, slender and sensitive to the conditions of growth. In a flower, form is presented not as immobile geometry, but as the result of a transition from a closed state to an open structure.

It is especially important that the flower makes it possible to perceive opening as a process rather than merely as a result. An opened flower still contains its preceding stage as a bud. A petal in its open state is a former layer of a closed form. It preserves traces of folding, pressure, internal arrangement and gradual unfolding. The centre of the flower does not appear only after opening; it was concealed within the bud and becomes visible only during a particular phase of morphogenesis. The flower is therefore not merely a radial figure, but a temporal structure. It demonstrates how form may pass from internal concentration to external manifestation. It is precisely this staged development that makes the flower important to the A–B–C–D model: the bud corresponds to the closed form; initial opening, to the beginning of differentiation; the multilayered floral structure, to the unfolded phase; and the fruit and seed, to the transition towards a new cycle.

When making comparisons with relief, the literal transference of biological language must first be rejected. Relief does not open like a flower in the biological sense. It possesses no tissue, genetic programme, petal growth or function of pollination. Relief may nevertheless demonstrate a similar morphological complex: centred or axial organisation, folded layers, diverging lines, active edges, zones of uplift and subsidence, recurrent boundaries, undulating contours and a rhythm of ridges and valleys. A mountain system, folded massif, volcanic relief, erosional cirque, submarine form or complex surface of the ocean floor may possess a pattern within which the matter of the Earth’s crust is organised through layers, ruptures, bends, edges and peripheral zones.

Within this triad, relief is the geological expression of form as the surface of a process. It demonstrates not growth, but a history of pressure, deformation, resistance and destruction. Where the flower reveals an internal biological structure, relief reveals geological time. Rock strata, folds, scarps, valleys, fissures, faults and edges are not decorative lines. They record sequences of influence, the memory of stresses, the action of water and wind, and changes in stability and destruction. If the flower demonstrates the rapid opening of a living form, relief demonstrates the slow opening of the Earth’s surface through prolonged processes. In both cases, form bears the memory of becoming, although this memory belongs to different temporal scales.

The layering of relief is particularly important to its comparison with floral form. Within a flower, the layers consist of petals, sepals, the coverings of the bud and the sequence of opening. Within relief, layers may consist of sedimentary strata, tectonic folds, lava flows, terraces, lines of erosion, scarps or morphological levels of the surface. In both cases, the layer is not a simple

surface. It indicates a phase of a process. The petal reveals a phase of biological unfolding. A stratum or fold reveals a phase of geological accumulation, pressure or deformation. The differences among mechanisms remain fundamental, but the structural role of the layer is comparable: it records a sequence within the becoming of form.

The edge of relief also possesses particular significance. Mountain ridges, shorelines, plateau margins, scarps, cliffs, valley contours, fault lines and submarine breaks in slope frequently display complex, irregular, undulating or serrated forms. These do not represent an accidental 'lack of beauty' in nature, but traces of the system's interaction with its environment. An edge arises where material encounters destruction, flow, pressure, weathering, erosion or a change in density. In a flower, the edge of a petal is a zone of growth and contact with the environment; in relief, the edge is a zone of geological and geomorphological stress. In both cases, the edge does not merely complete a form, but demonstrates how that form interacts with what lies beyond it.

Radiality is not present within every type of relief and should not be imposed upon every geological object. It is nevertheless expressed with sufficient clarity in certain forms: volcanic structures, craters, dome-shaped uplifts, erosional cirques, radially diverging valleys, mountain systems surrounding a central zone, submarine domes and some forms of sedimentary or lava spreading. The radiality of relief differs from that of a flower. Within a flower, it is connected with biological organisation around a reproductive centre. Within relief, it is connected with the distribution of matter, pressure, runoff, destruction or uplift around a geomorphological node. The structure 'centre—periphery' may nevertheless recur. It is precisely this recurrence that forms the subject of comparative analysis.

The third element of the triad—the nebula—transfers the comparison to the cosmic level. Methodological caution must be especially rigorous here. Images of nebulae frequently possess great aesthetic power: they may resemble flowers, clouds, wings, waves, shells, petals, flashes or opened envelopes. Such impressions must not, however, become evidence. A cosmic nebula is not a living form, does not possess a biological centre, does not open from a bud and does not produce petals in the botanical sense. It is a structure of gas, dust, plasma or luminous matter associated with astrophysical processes. Its morphology may nevertheless display a centre, shells, layers, filaments, radiant structures, ruptured edges, expansion, ejection and peripheral dispersal.

The principle of shell-like organisation is especially important within a nebula. Many cosmic formations of gas and dust possess an inner region of increased brightness or density surrounded by more diffuse, expanding, fragmented or filamentary layers. These layers may result from the ejection of matter, a shock wave, interaction between radiation and the environment, star-forming processes or stellar destruction. At the morphological level, such a structure may be compared with the layering of flowers and relief. The comparison must, however, be formulated precisely: these are not 'cosmic petals', but shells and regions of matter creating a visible multilayered form.

The edge of a nebula is frequently the most expressive part of its image. It may be scalloped, ruptured, filamentary, smoky, ragged, stepped or diffusely cloud-like. It is precisely at the periphery of a nebula that the struggle between structure and dispersal becomes visible. The inner region may maintain a particular density, while the outer edge demonstrates the transition towards the surrounding cosmic environment. This recalls the general morphological principle of the active edge: the boundary of form is not a passive line, but an area of contact, exchange, destruction, expansion or further differentiation. In a flower, the edge of a petal records a

biological phase of opening; in relief, the edge records the geological interaction between surface and environment; in a nebula, the edge records the cosmic dynamics of matter and radiation.

The radiality of a nebula may be expressed through diverging shells, radiant ejections, symmetrical or partially symmetrical expansions, a central luminous region and the peripheral distribution of matter. Excessive simplification must once again be avoided. Not every nebula is radial. Many possess asymmetrical, filamentary, chaotic or elongated forms. The visual-triad method should therefore select not an abstract 'nebula in general', but a specific type of cosmic object within which the analysed features are genuinely expressed. Deviations must also be recorded: displacement of the centre, unevenness of shells, ruptures, symmetry breaking and local concentrations. Such deviations do not weaken the analysis, but bring it closer to the realities of nature.

When the three objects are compared rigorously, it becomes possible to see that each is governed by its own mechanism while a particular morphological grammar recurs. Within the flower, the centre is concealed in the bud and becomes manifest during opening. Within relief, the centre may be a zone of uplift or pressure, crater, dome or node of diverging lines. Within a nebula, the centre may be a region of luminosity, density or star formation, or a source of ejection. Within the flower, layers are represented by petals and coverings. Within relief, they appear as strata, folds, terraces and scarps. Within the nebula, they appear as shells of gas and dust, waves and filamentary zones. In the flower, the edge is the delicate periphery of the petal. In relief, it is a ridge, scarp, break in slope or line of destruction. In the nebula, it is a transitional zone between structure and a diffuse environment. Opening is biological in the flower, geomorphological in relief and astrophysical in the nebula. In all three cases, however, form may be read as a transition from a concentrated or internally stressed state towards a more unfolded and articulated structure.

It is here that the 'flower—relief—nebula' triad acquires particular significance to the hypothesis of the Unified Matrix of the Universe. It demonstrates that resemblance may be not only external, but structural and processual. External resemblance is limited to the impression that the forms 'look alike'. Structural resemblance records the recurrence of centre, layer, edge and radiality. Processual resemblance adds dynamics: a hidden or concentrated form passes into an opened state; the periphery becomes active; layers diverge or become exposed; and the centre enters into a relationship with the edge. Such a logic is no longer merely an aesthetic analogy. It becomes the basis for a research question: why do different systems existing under different physical conditions sometimes arrive at similar morphological solutions?

The answer should not be premature. Several explanations are possible. Within biology, the radiality and layering of the flower are associated with reproductive function, protection of the reproductive organs, optimisation of interactions with pollinators and an internal developmental programme. Within relief, layering and edge may result from mechanical pressure, differing levels of rock resistance, erosion and tectonic history. Within a nebula, shells and edges may result from ejections, shock waves, density differences and interactions between radiation, gas and dust. The recurrence of morphological features does not therefore necessarily indicate a single physical mechanism. It may indicate a more general level: different systems passing from concentration to propagation, stress to dispersal or interior to periphery frequently employ similar structural solutions.

In this respect, the triad reveals one of the principal ideas of the study: the universality of the Matrix, if it exists, should not be understood as the identity of processes. It may be understood as

the recurrence of morphological scenarios. The same scenario may be realised through different media: floral tissue, the rock of relief and the gaseous and dusty environment of a nebula. In every case, the material establishes its own constraints. Biological tissue is elastic, grows and is regulated through living processes. Geological rock deforms, disintegrates, accumulates and resists on a different temporal scale. Cosmic gas expands, glows, disperses, compresses and interacts with radiation. In every case, however, form may become organised through centre, shell, edge, layer and opening.

The category of the active edge is especially illustrative. In the preceding chapters, the edge was already examined as a zone of contact between a system and its environment. Within the 'flower—relief—nebula' triad, this category receives confirmation across levels. In a flower, the edge of the petal simultaneously completes the form and records its growth. It may be smooth, undulating, serrated, dissected, asymmetrical, delicate, coloured and functionally significant. In relief, the edge records the boundary of surface stability: ridge, cliff, shore, fold line, plateau margin or fault zone. In a nebula, the edge reveals the transition of matter from a structured to a diffuse state and a region of interaction among density, radiation and the surrounding environment. In all three cases, the edge is not an external frame, but an active morphogenetic zone.

Layering within this triad should likewise be understood as the memory of a process. The petals of a flower are not simply compositional elements, but traces of the enclosed bud and its sequential opening. The layers of relief are not simply bands upon a surface, but the results of accumulation, pressure, deformation and destruction. The shells of a nebula are not merely coloured regions within an image, but traces of cosmic processes involving expansion, interaction and the distribution of matter. A layer is always connected with time. It demonstrates that form did not arise immediately in its final condition, but possesses a history. Layering is therefore one of the most powerful invariants of comparative morphology: it translates form from space into time.

Radiality, in turn, demonstrates the relationship between centre and periphery. In a flower, it is frequently expressed clearly: petals diverge from the heart of the flower, forming an opened system. In relief, radiality may be more concealed: valleys, folds or flows may diverge from an uplift, crater, dome or central zone of destruction. In a nebula, radiality may manifest itself as expanding shells, radiant ejections, arcs of gas and dust, symmetrical regions of luminosity or diverging filaments. In every case, radiality is associated with the directional propagation of form. It demonstrates that the centre does not remain closed, but enters into a spatial relationship with the periphery.

Opening unites layering, edge and radiality within a single processual scheme. In a flower, opening is literally observable: the bud opens, petals diverge, the centre becomes visible and the periphery expands. In relief, opening is a metaphor, but not an arbitrary one. The Earth's surface may 'reveal' its internal structure through erosion, faults, folds, exposed strata, and the formation of valleys and edges. Here, the hidden becomes visible not through growth, but through the geological action of time. Opening within a nebula is likewise not biological. It may express the expansion of a shell, the ejection of matter, rupture of a dense region or formation of a luminous periphery. In all three cases, opening signifies a transition from a less expressed structure towards greater manifestation.

It is important to recognise that opening does not always lead to a harmonious form. In a flower, opening may be symmetrical and stable, but it may also be disrupted, asymmetrical or damaged.

In relief, opening through erosion may lead to destruction, exposure and disintegration of a massif. In a nebula, expansion may signify not growth, but dispersal, explosive dynamics or the residual trace of destruction. Within the present hypothesis, opening should therefore not always be understood as a positive or 'living' process. It signifies the transition of internal stress into spatial form. That transition may involve growth, deformation, rupture, erosion, ejection or dispersal. For precisely this reason, opening must be used as a morphological category rather than a biological metaphor.

When this triad is connected with the A–B–C–D model, its analytical potential becomes apparent. The flower makes it possible to trace the model most directly:

- A is the closed bud;
- B is initial opening;
- C is the multilayered floral structure;
- D is complete opening and transition to the fruit.

The model must be applied more cautiously to relief:

- A may correspond to an internally stressed or as yet undissected structure;
- B to initial faults, uplift or erosional lines;
- C to a developed system of folds, valleys, scarps and layers;
- D to a stabilised or maximally expressed surface.

Within the nebula:

- A may be a region of concentrated matter;
- B an initial ejection or expansion;
- C the formation of shells, filaments and peripheral zones;
- D a developed structure of gas and dust or a stage of dispersal.

Such a scheme does not prove the identity of the processes, but helps describe them through a shared language of stages.

A visual illustration of this triad may be especially useful if constructed not as an artistic collage, but as an analytical diagram (*Fig. 1*). It should present three objects—a flower, relief and nebula—with the same features identified within each: centre, layers, active edge, radial direction and region of opening. Such an illustration should not assert that the three objects are 'the same'. On the contrary, it should demonstrate that, despite their different material mechanisms, comparable structural relationships may be identified within them. The image would then perform a methodological function: it would become not an ornament to the chapter, but a visual map of the analysis.

From a scientific perspective, it is especially important that such an illustration be accompanied by an explanation of the limits of the comparison. The flower may be analysed as an organism or plant organ; relief, as the result of geological time; and the nebula, as an astrophysical structure. They cannot be compared according to matter, rate of development, causal system or function. They may be compared through form as organisation: where the centre is situated, how the layers are structured, how the edge forms, how the periphery is connected with the inner region, whether signs of radiality are present and whether it is possible to speak of a stage of opening. This approach makes the visual material scientifically admissible.

The ‘flower—relief—nebula’ triad also demonstrates why the hypothesis of the Unified Matrix of the Universe requires not only philosophy, but also future formalisation. If structural features genuinely recur within these three objects, attempts may be made to measure them. Centredness may be described through the distribution of elements relative to a central region. Radiality may be described through the directions of lines, rays, folds, petals or filaments. Layering may be described through the number of levels, their nesting, sequence and contrast. The edge may be described through its degree of articulation, fractal dimension, undulation or fragmentation. Opening may be described through the relationship among closed, intermediate and open forms, where stages or a reconstruction of the process are available. The visual triad would then become a preliminary stage of morphometric research.

Not all features are equally easy to formalise. The centre of a flower may be identified relatively simply, but the centre of relief or a nebula may be displaced, multiple or conditional. The layers of a flower are directly visible, while those of a nebula may depend upon the observational range and image processing. An edge of relief may be defined on one map, but disappear or change at another scale. Radiality may be strongly expressed within one object and weakly within another. Future testing should therefore consider not the absolute presence of a feature, but its degree of expression. The triadic method should be gradational rather than binary: features may be strong, moderate, weak, disputed or absent.

Such gradation increases the scientific seriousness of the hypothesis. If the researcher acknowledges that not every nebula resembles a flower, not every relief possesses radiality and not every flower demonstrates ideal layering, the study moves from general assertions into analysis. The hypothesis becomes testable because it allows different outcomes. It may be supported within some classes of form, restricted within others and revised within still others. Comparative morphology should not seek to prove that everything resembles everything else. Its purpose is to establish which features genuinely recur, in which combinations and under which conditions.

In this respect, the ‘flower—relief—nebula’ triad may serve as a model for the entire chapter. It is visually powerful, but requires rigorous treatment. It spans a broad range of scales—from the living organism to the Earth’s surface and cosmic environment. It contains the principal invariants of the hypothesis: centre, layer, edge, radiality and opening. It makes it possible to demonstrate differences among mechanisms and similarities in morphological logic. At the same time, it compels the analysis continually to preserve the boundary between analogy and evidence. This triad is therefore not merely a striking example, but a methodological test of the entire BIO–GEO–COS concept.

The philosophical significance of the triad lies in its return of form to the concept of becoming. The flower becomes an opened form from a bud. Relief becomes a visible terrestrial structure through the prolonged action of forces and time. The nebula becomes an observable cosmic form through the redistribution of matter, light and energy. In all three cases, form is not merely a contour, but a trace of process. It demonstrates that matter does not simply occupy space, but organises itself, develops stress, opens and creates edges, layers and a periphery. This is precisely what makes form an object of scientific-philosophical analysis.

Within the hypothesis of the Unified Matrix of the Universe, the ‘flower—relief—nebula’ triad makes it possible to formulate an important interim conclusion. If different systems demonstrate a similar complex of features—layering, active edge, radiality and opening—this should not immediately be regarded as evidence of a single physical cause. Yet nor should it be dismissed

without analysis as mere coincidence. Such a complex of features should be described, classified and incorporated into a programme of testing. It may indicate that, when forming complex structures, different levels of matter employ similar morphological solutions: concentration, peripheral unfolding, formation of shells, an active boundary and transition from hidden stress to manifest form.

Thus, the first principal triad demonstrates the essence of comparative morphology. The flower provides a clear biological model of opening. Relief demonstrates the slow geological memory of form. The nebula carries the analysis to the cosmic scale, where layers, edges and radial structures arise within another environment and through other processes. There is no direct causal identity among them, but a possible structural relationship exists at the level of morphological invariants. It is precisely this relationship that must become the subject of further rigorous study.

The 'flower—relief—nebula' triad therefore does not complete the proof of the hypothesis, but opens its comparative-analytical stage. It demonstrates how the study may proceed from visual impression to a feature matrix, from image to invariant and from isolated resemblance to methodologically controlled comparison. This constitutes its significance to the study as a whole: it demonstrates that the hypothesis of the Unified Matrix of the Universe can be discussed seriously only when every analogy becomes an analysis of features, every form is examined within its own disciplinary context and every resemblance is tested through the differences among levels.

17.3. The 'Leaf—Valley—Cosmic Shell' Triad

The 'leaf—valley—cosmic shell' triad differs from the preceding 'flower—relief—nebula' triad in its internal emphasis. Whereas the first triad foregrounded layering, radiality, the active edge and opening, the central elements here are the axis, lateral branching, the network, recurrent boundaries and the distribution of form across a surface. This triad is less visually striking, but no less important methodologically. It enables a transition from the image of an opening form to the analysis of a directed structure in which a principal line organises lateral branches and boundaries recur at different scales.

The leaf, valley and cosmic shell belong to radically different levels. A leaf is a biological plant organ associated with photosynthesis, gas exchange, transpiration, mechanical support, growth and interaction with the external environment. A valley is a geomorphological form arising through the action of water, ice, tectonic movements, erosion, slope processes, differences in rock resistance and prolonged time. A cosmic shell is an astrophysical structure that may be associated with gas expansion, shock waves, the remnants of explosive processes, bubbles within the interstellar medium, nebular shells, emission zones, filamentary boundaries and the redistribution of matter. These three objects cannot be identified with one another. Yet it is precisely their difference that makes the comparison meaningful: if axiality, lateral differentiation and a hierarchy of boundaries recur within such different systems, they become a subject for comparative morphological analysis.

Within this triad, the leaf serves as a biological model of planar unfolding. It is not simply a green surface. Its form is organised through a midrib, lateral veins, a network of smaller conducting lines, an edge, a blade, a base, an apex, growth zones and the distribution of tissues. The leaf

demonstrates how form may unfold not only radially, like a flower, but also axially and across a plane: from base to apex, from the central line to lateral areas, from the midrib to smaller branches, and from the internal conducting system to the outer edge. It reveals particularly clearly the principle according to which an entire surface is organised through a system of lines.

The midrib of a leaf performs the role of a morphological axis. It establishes the direction of the form, connects the base and apex, distributes the lateral elements and maintains the overall symmetry or asymmetry of the blade. Unlike the centre of a flower, which usually organises the space around itself radially, the leaf axis establishes an elongated direction. It does not so much concentrate form as conduct it through space. Lateral veins extend from it and may be straight, curved, reticulate, pinnate, parallel, fan-shaped or complex. These veins create a secondary order: the leaf surface is divided into zones, fields, cells, lobes and recurrent areas.

It is here that the leaf becomes an important model of branching. The branching of a leaf does not coincide with the branching of a tree as a whole, although it belongs to the same general logic of transition from a principal line to lateral directions. The midrib resembles a trunk in miniature, but this resemblance should not be understood literally. What we encounter in a leaf is not a trunk, but a conducting and mechanical structure that distributes substances and supports the blade. The morphological principle is nevertheless similar: there is a principal line, from which lines of the second order extend; still smaller lines may branch from these, while fields form between them. Such a structure creates a hierarchy of scale in which a larger direction organises smaller ones.

The edge of the leaf is of particular significance. It may be smooth, serrated, undulating, lobed, dissected, scalloped, needle-like or complex. The edge is not an accidental termination of the surface. It is connected with tissue growth, the distribution of mechanical stresses, water balance, illumination, protection, evaporation, evolutionary adaptation and the geometry of the blade as a whole. In morphological terms, the leaf edge demonstrates how the internal network of veins reaches the periphery and how the surface interacts with its environment. It is both a zone of termination and a zone of activity. Through its edge, the leaf comes into contact with air, light, moisture, movement and external influences.

The recurrent boundaries within the leaf are also significant. Veins do not merely conduct substances; they divide the blade into areas. Between the larger and smaller veins, regions of tissue arise that form a distinctive cellular structure. At one scale, the boundary is the outer contour of the leaf. At another, it is a lateral vein. At a third, it is a minor vein separating one area of tissue from another. The leaf thus demonstrates a nested system of boundaries. This system is not perfectly fractal in the strict mathematical sense, but it possesses a hierarchy of scale: larger lines generate smaller ones, which in turn organise an even finer surface. This is why the leaf is one of the most convenient biological objects for analysing the axis, branching and recurrent boundaries.

The second element of the triad—the valley—translates this morphological logic into a geological environment. A valley is not a living organ and possesses no biological vein. Yet it frequently organises relief according to an axial principle. The principal valley establishes the direction of the surface and gathers lateral valleys, ravines, hollows, channels, temporary watercourses and slope lines. Whereas a leaf vein distributes substances within an organ, a valley collects and directs flows of water, sedimentary material, eroded rock and the energy of relief. In both cases, the principal line becomes the organising element of a plane or surface.

The valley as a geological form is especially important because it unites axis and network. On a map or satellite image, a valley system may resemble leaf venation. The principal valley extends like a central line; lateral valleys diverge from it at different angles; small ravines enter larger forms; and the entire system creates a drainage hierarchy. Yet a boundary must immediately be drawn: this is not biological branching, but hydrological, erosional and geomorphological branching. Its mechanism is connected with the movement of water, surface gradient, rock resistance, climate, vegetation, tectonic structures and time. What is common is not the origin, but the morphological principle: a principal axis, lateral branches, nested lines and recurrent boundaries.

Like the leaf, the valley creates boundaries. Valley sides, channel banks, terrace lines, slope breaks, ravine edges, watersheds, scarps and alluvial fans form a complex system of transitions. These boundaries do not merely separate one part of the relief from another. They reveal the action of a process. The valley side records the zone in which the surface has been incised. The channel marks the active line of flow. A terrace preserves the memory of a former valley level. A watershed marks the boundary between drainage systems. A ravine records an initial or local form of erosional development. The valley therefore proves to be not a static depression, but a spatial record of movement, time and energy.

If the leaf may be regarded as a plane of biological unfolding, the valley is a surface of geological dissection. In the leaf, tissue unfolds to form a network of veins and an edge. In the valley, the Earth's surface is dissected to form a channel, slopes, lateral lines and watersheds. These processes are opposite in their mechanisms: the leaf grows and forms its conducting network from within, whereas a valley frequently arises through destruction, incision, removal and redistribution of material. At the morphological level, however, both processes create a structure in which the principal line organises lateral elements and boundaries recur at different scales. This difference between mechanisms amid structural similarity is one of the most important aspects of the triad.

Fractal or quasi-fractal organisation is especially significant here. In a leaf, a large vein may branch into smaller ones, and these into still finer veins, creating a hierarchy of conducting lines. In a valley network, the principal river or valley has tributaries; the tributaries have smaller tributaries; and these in turn possess ravines and temporary channels. At different scales, the relationship 'principal line—lateral branch—minor line' recurs. This does not mean that the leaf and valley are identical fractals. Both objects do, however, demonstrate the recurrence of organisation across scales. It is this recurrence that makes them comparable within the framework of comparative morphology.

The third element of the triad—the cosmic shell—requires a more nuanced definition. In this context, a cosmic shell may be understood not as a single specific type of object, but as a class of astrophysical forms in which matter is organised around a region of expansion, ejection, shock-wave propagation, stellar wind, gas-and-dust structure or the interaction of radiation with the surrounding medium. These may include nebular shells, residual structures of explosive processes, interstellar bubbles, arcs, filamentary shells, gaseous fronts, ring-shaped or partially ring-shaped formations, and thin luminous boundaries separating a region of greater density or activity from the surrounding space. What matters is not the name of a particular class, but its morphological features: a shell possesses a surface, a boundary, an interior region, a periphery, filaments, ruptures and frequently a complex network of lines.

The cosmic shell differs from the leaf and the valley in that its axis may be less evident. A leaf usually possesses a midrib, while a valley has a principal line of drainage or topographical depression. A cosmic shell may be spherical, elliptical, ruptured, asymmetrical, filamentary or fragmented. In certain cases, however, it is possible to identify a direction of expansion, an axis of ejection, an elongated form, a dominant front, a central region or a system of arcs that establishes an internal directionality. When analysing a cosmic shell, therefore, one cannot automatically search for the same kind of axis as in a leaf. The questions must be formulated differently: does the shell possess a principal direction of organisation? Is there a distribution of lateral or peripheral structures? Are there recurrent boundaries? Is there a hierarchy of filaments, arcs, fronts or shell layers?

The cosmic shell is particularly important for the analysis of recurrent boundaries. In astrophysical structures, a boundary is often not a sharp line. It may be a transition zone between dense and rarefied gas, between more and less luminous regions, between a shock-wave front and the surrounding medium, or between an internal bubble and an external cloud. Such a boundary may be filamentary, ragged, arcuate, scalloped or reticulate. In this sense, it is comparable with the edge of a leaf and the side of a valley not in terms of matter, but in terms of morphological function: it marks the place where form enters into an active relationship with its environment.

Whereas the boundary of a leaf is connected with the growth and function of the organ, the boundary of a valley with erosion, slope processes and watersheds, and a cosmic boundary with the distribution of matter, radiation, pressure, expansion, compression or turbulence, in every case the boundary is not a passive contour, but the trace of an interaction. It reveals where a system ceases to be internally homogeneous and begins to pass into its environment. Within the ‘leaf—valley—cosmic shell’ triad, the boundary therefore becomes one of the principal invariants. It recurs as the leaf edge, the valley side and the shell front, but in each case possesses its own nature and mechanism.

Lateral branching within a cosmic shell must likewise be understood cautiously. There are no plant veins or channel networks here. There may, however, be fibres, jets, arcs, filaments, localised condensations, ruptures, ray-like directions and secondary fronts that diverge from the principal structure or cross its surface. Images of certain nebulae and gas-and-dust shells reveal complex filamentary networks in which large arcs are connected with smaller thread-like structures, while the periphery contains recurrent bends and ruptures. This is not branching in the botanical or hydrological sense. It may nevertheless be regarded as the morphological differentiation of a shell into major and minor lines.

Within the cosmic shell, therefore, the triad receives not a literal but a limiting expression. The leaf provides a clear axis and venation. The valley provides a principal line and a drainage hierarchy. The cosmic shell provides a more complex and frequently asymmetrical system of fronts, boundaries and filaments. This difference is important. If a cosmic shell looked too much like a leaf, the comparison would appear suspiciously aesthetic. Because the similarity is partial and structural, however, it demands greater precision: which features persist in the transition from the biological to the geological and cosmic levels, and which disappear or become transformed?

The leading invariant of this triad is the axis. Yet the axis is not always geometrically straight or centrally positioned. In the leaf, it is expressed as the midrib or principal conducting pathway. In the valley, it appears as the main line of depression, the channel, the direction of drainage or the

elongated form of the relief. In the cosmic shell, it may take the form of a direction of expansion, an axis of ejection, an elongated arc, a principal front or the dominant vector along which matter is distributed. The axis establishes directionality rather than symmetry. It transforms a form from a simple region into an organised space. Through the axis arise the distinctions between base and apex, upper and lower, internal and external, principal and lateral.

The second invariant is lateral branching. In the leaf, it is associated with veins of the second and third orders. In the valley, it appears through tributaries, ravines, hollows, lateral valleys and slope lines. In the cosmic shell, it is expressed through filaments, arcs, local ruptures and secondary fronts. Lateral branching demonstrates that form does not remain a single line. It becomes distributed, grows more complex, encompasses a surface, creates a network and translates direction into space. Branching is a means of extending organisation. A principal line without branching would be too simple. Lateral branches transform it into a system.

The third invariant consists of recurrent boundaries. In the leaf, these appear as the edge of the blade, the boundaries between areas of venation, the contours of lobes, serrations and cells. In the valley, they occur as channel banks, slope breaks, terraces, watersheds, ravine edges and basin boundaries. In the cosmic shell, they are expressed as fronts, arcs, filamentary edges, shell layers, and transitions of density and luminosity. A recurrent boundary demonstrates that form is organised not by a single contour, but by numerous internal and external divisions. These divisions create structure. They make form legible.

If the triad is considered through the A–B–C–D model, its processual dimension becomes apparent.

In the leaf, stage A may correspond to an embryonic leaf form that is still folded or only weakly differentiated. Stage B is the emergence of the principal axis and the first lateral veins. Stage C is the formation of a developed venation network, surface and edge. Stage D is the complete leaf blade, ready to function and incorporated into the plant's overall cycle.

In the valley, stage A may be a potential drainage line or a weak zone within the surface. Stage B is the initial incision, direction of flow or erosion. Stage C is the development of lateral tributaries, slopes, terraces and the network. Stage D is a mature valley system with a pronounced hierarchy and clearly defined basin boundaries.

In the cosmic shell, stage A may correspond to a region of concentration or an initial zone of influence. Stage B is the onset of expansion, a front or an ejection. Stage C is the formation of the shell, its arcs, filaments and marginal structures. Stage D is a developed, fragmented or dispersing shell.

Such a scheme does not prove that the processes are unified, but it allows them to be described through a shared grammar of stages.

The question of the surface is particularly important. The leaf, valley and cosmic shell relate to surfaces in different ways. The leaf is itself a surface unfolded for interaction with light and air. The valley is a form of the Earth's surface dissected by the movement of matter and energy. The cosmic shell is a surface in a more conditional sense: it is not a solid wall, but a transitional region, front, layer or boundary within the distribution of gas and radiation. Nevertheless, in all three cases, form is read through the surface and its lines. The surface becomes a field of morphogenesis: axes, branches, boundaries, edges and recurrent structures arise upon it.

It is this that makes the ‘leaf — valley — cosmic shell’ triad especially significant to the hypothesis of the Matrix. It demonstrates that morphogenetic invariants may manifest themselves not only in volumetric or radial forms, but also in planar and surface-based systems. If the Matrix is understood as the structural logic of form generation, it must describe not only opening from a centre, but also distribution across a surface. The leaf demonstrates a biological surface; the valley, a geological surface; and the cosmic shell, an astrophysical surface of transition. In all three cases, the surface is not passive. It is organised by lines, boundaries and stresses.

It must nevertheless be acknowledged that this triad is less visually obvious than the ‘flower—relief—nebula’ triad. A flower and a nebula may immediately create an impression of similarity. The leaf, valley and cosmic shell require more attentive reading. Their resemblance is not so much pictorial as structural. It becomes visible when the axis, branching and boundaries are analysed. This makes the triad more rigorous: it relies less upon an aesthetic impression and more upon a matrix of features. It is therefore especially useful for the scientific substantiation of the hypothesis. It demonstrates that comparative morphology can operate not only where objects look alike, but also where they are connected by a recurrent organisational scheme.

A visual illustration of this triad may be constructed as an analytical diagram (*Fig. 2*). It should present a leaf with its midrib and lateral venation, a valley network with a principal valley and lateral branches, and a cosmic shell with a front, filaments and recurrent boundaries. Rather than emphasising a general ‘resemblance’, the illustration should identify three features: the principal axis, lateral structures and recurrent edges. Such a diagram would enable the reader to see that the comparison concerns neither colour, scale nor external beauty, but the manner in which lines and surfaces are organised.

From a scientific perspective, this triad opens up the possibility of formalisation. In the leaf, it is possible to analyse the angles at which veins diverge, venation density, the hierarchy of conducting lines, the degree of branching, the form of the edge and the distribution of cells. In the valley system, one may examine stream order, tributary length, junction angles, the fractal dimension of the network, basin structure, the relationship between the principal valley and its lateral branches, the form of watersheds and the recurrence of slope boundaries. In the cosmic shell, it is possible to analyse filamentation, the fragmentation of the front, the distribution of luminosity or density, the degree of discontinuity along the edge, the direction of arcs, the presence of a dominant axis and the nesting of shell structures. Such parameters do not make the objects identical, but they allow them to be compared more rigorously.

The analysis of network structures may be particularly promising. Leaf venation, a valley network and a filamentary shell may be represented as graphs: nodes, lines, branches, connections, hierarchy, length distribution, connection density and branching order. These graphs would, of course, reflect different physical realities. In the leaf, the network is connected with the transport of substances. In the valley, it is associated with water drainage and erosional development. In the cosmic shell, it relates to the distribution of matter, fronts and filaments. Certain common parameters may nevertheless be compared mathematically: degree of branching, hierarchy, anisotropy, line density and the relationship between the principal direction and lateral structures. This is one of the paths through which the visual triad may become a research instrument.

The analysis of the edge is no less important. The leaf edge may be described in terms of serration, waviness, lobation, dissection and the fractal complexity of its contour. The valley edge may be analysed through its slope-break line, slope boundaries, the dissection of watersheds and the

form of the basin. The edge of a cosmic shell may be described through scalloping, discontinuity, filamentation, luminosity gradient and the complexity of the transitional zone. In each case, the edge may be measured not only visually, but also quantitatively: through curvature, contour length, scale dependence, degree of fragmentation, heterogeneity and its relationship with the internal network. This is especially important because, within the hypothesis of the Matrix, the edge is regarded as an active zone of morphogenesis.

Here too, however, the limits of comparison must be remembered. The leaf network is created by living tissue. The valley network forms through the destruction and transport of material. The cosmic shell arises through the physics of gas, radiation and fields. If these distinctions are removed, the analysis becomes invalid. Every comparison must therefore preserve a dual formula: the mechanisms are different, but the morphological principle is comparable. This formula is not a concession to criticism, but the foundation of the study's scientific integrity. The hypothesis of the Unified Matrix of the Universe should be strong not because it ignores differences, but because it can identify recurrent structures without erasing them.

This triad also helps to refine the concept of self-similarity. Here, self-similarity does not necessarily mean the exact recurrence of the same form at every scale. In the leaf, veins of different orders may be similar in principle but are not identical. In a valley network, the principal valley, tributaries and ravines repeat the relationship between principal and lateral lines, but every level depends upon local conditions. In a cosmic shell, large arcs and small filaments may create a hierarchy of scale, but not a strict mathematical copy. What is at issue, therefore, is constrained natural self-similarity rather than a perfect fractal construction. This qualification is important to the serious scientific language of the study.

The philosophical significance of the 'leaf—valley—cosmic shell' triad lies in its presentation of form as a distributed system. In the preceding triad, form opened from a centre. Here, form extends along an axis and through a network. This is a different type of morphogenetic logic. It is associated not so much with radial opening as with conduction, collection, direction and dissection. The leaf conducts substances and organises a surface for exchange. The valley collects and directs flows. The cosmic shell records fronts and the distribution of matter in space. In all three cases, form is not closed within itself. It is a system of relationships between lines, boundaries, flows and the environment.

This is why the leaf, valley and cosmic shell allow the concept of the Matrix to be expanded. If the Matrix is understood solely as a circle, flower or radial opening, the hypothesis becomes too narrow. It risks reducing universal morphogenesis to a single image. Yet actual nature displays numerous types of organisation. Alongside the circle, there is the axis. Alongside radiality, there is branching. Alongside opening, there are conduction and distribution. Alongside the centre, there is the line. The triad demonstrates that the Unified Matrix of the Universe must encompass not a single geometric motif, but a system of invariants capable of combining in different ways.

This idea has methodological significance. The hypothesis should not search for a single universal sign that recurs in every object. It is more productive to search for a set of structural operations: centring, axial direction, branching, layering, edge formation, shell formation, self-similarity, opening, closure and transition to a new cycle. In some objects, the centre predominates; in others, the axis; in still others, the layer, edge or network. The 'leaf—valley—cosmic shell' triad demonstrates precisely this axial and networked aspect of the system.

The comparison of the three levels thus allows an intermediate conclusion to be formulated. The leaf, valley and cosmic shell do not share a common mechanism of origin. They cannot be

regarded as different manifestations of a single physical process. Yet a similar morphological scheme may be identified within them: a principal line or direction, lateral differentiation, recurrent boundaries, a hierarchy of scale, an active edge and a relationship between form and environment. This scheme may be called the axial-network model of comparative morphology. It differs from the radial-layered model of the preceding triad, but does not contradict it. Both models are different expressions of the more general language of the Matrix.

Thus, the ‘leaf—valley—cosmic shell’ triad demonstrates that the hypothesis of the Unified Matrix of the Universe must address not only striking images of opening, but also more rigorous structures of distribution. The leaf teaches us to perceive an axis and a lateral network within biological form. The valley demonstrates the same principle upon a geological surface, but through drainage, erosion and time. The cosmic shell transfers the analysis to an extreme scale, where boundaries, fronts and filaments arise within a gas-and-dust medium. There is no direct identity between these objects, but there is a recurrent logic of organisation: form extends across a surface, creates principal and lateral lines, forms edges and leaves the trace of a process within space.

This is the significance of the chapter’s second key triad. It strengthens the BIO–GEO–COS method by demonstrating that comparative morphology is not confined to visually beautiful correspondences. It is capable of analysing deeper structural relationships—axis, branching, boundary, surface and hierarchy of scale. It is precisely these relationships that may provide material for subsequent morphometrics, fractal analysis, digital classification and statistical testing. The ‘leaf—valley—cosmic shell’ triad is therefore not merely an illustration of the hypothesis, but one of its working instruments: it transfers the image of the Matrix from the realm of the open flower to that of the axial network, distributed surface and recurrent boundaries.

17.4. The ‘Bud—Stone—Planetary Structure’ Triad

The ‘bud—stone—planetary structure’ triad occupies a special place within the comparative morphology of BIO–GEO–COS. Whereas the ‘flower — relief — nebula’ triad enabled the analysis of open form, and the ‘leaf — valley — cosmic shell’ triad focused upon the axis, lateral branching and recurrent boundaries, the subject here is closed form. The focus is neither opening as a completed visibility nor the network as a distributed surface, but a state of internal concentration, shell-like organisation, concealed tension and the gradual manifestation of structure. This is why the bud, stone and planetary structure form an important yet methodologically complex triad.

The complexity of this triad lies in the ease with which it may be misunderstood. A bud is a living biological form incorporated into the development of a plant. A stone is not a living organism and does not open like a flower. A planetary structure is not a bud on a cosmic scale and contains no biological programme of development. This triad should therefore not be used as a metaphor for a ‘living planet’ or a ‘biological stone’. Its purpose is different: to demonstrate that closed or semi-closed forms may exist at different levels of matter and may conceal structure, tension, layering and a potential line of rupture or future opening. In this sense, the bud, stone and planetary body are comparable not in terms of matter or mechanism, but through the morphological logic of closure and the subsequent manifestation of internal order.

Within this triad, the bud is the initial and most readily apparent model of closed form. It is a temporarily enclosed biological structure within which the future flower is already present,

although it has not yet manifested itself in an open state. The bud is not an empty shell. Its closure contains an internal organisation: petals are arranged in layers, reproductive elements are protected, the growth axis retains its direction, the outer sepals form a protective contour, and the tissues are undergoing gradual extension and preparation for opening. Externally, a bud may appear to be a simple, smooth, oval, spherical or pointed body. Yet this external simplicity conceals complex internal differentiation.

It is precisely this that makes the bud one of the key images within the hypothesis of the Unified Matrix of the Universe. It demonstrates that form may already be organised before it becomes fully visible. The potential of form is not equivalent to the absence of form. Within the bud, the future flower has not yet opened, but it has already been prepared structurally. The petals do not emerge from nothing at the moment of opening; they already exist in a folded, compressed and overlapping state. The centre of the flower is not yet exposed to view, but it already occupies its position. The layers have not yet separated, but their order already exists. Closed form may therefore be no less substantial than open form. It is a state of concealed completeness.

Within the A–B–C–D model, the bud corresponds to stage A or to the transition from A to B. Stage A is the closed seed or enclosed potential form. The bud does not coincide completely with the seed, since it represents a later phase of plant development, but in morphogenetic terms it repeats the same principle: an internally organised structure is preserved within a closed contour until the moment of opening. Stage B begins when the closed form loses its absolute closure: the first gaps appear, the edge comes under tension, the petals begin to separate and the contour changes. Stage C is the multilayered opening during which the former internal layers become visible. Stage D is complete opening and the transition to a new function: flowering, fruiting and reproduction. The bud is important precisely because it makes the boundary between concealed and manifested form visible.

Three features are particularly significant within the bud: the shell, internal tension and the line of opening. The shell protects and holds the form together. Internal tension is created by tissue growth, an increase in volume, changes in the position of the petals, biomechanical pressure and preparation for opening. The line of opening may be predetermined by the arrangement of the petals, seams, points of least resistance or the geometry of the folded structure. When opening begins, it does not occur arbitrarily. The bud opens where its internal organisation and external shell permit the transition from closure to openness. The opening of a bud is therefore not an act of destruction, but the logical manifestation of a previously concealed order.

The stone introduces an entirely different type of closed form into this triad. It possesses no biological growth, contains no future flower and does not open within an organic cycle. A stone may nevertheless be regarded as a morphogenetic body preserving within itself the history of matter, pressure, crystallisation, layering, fracture formation, heating, cooling, sedimentation, metamorphism or destruction. Externally, a stone is often perceived as an inert object. Yet its form, texture, layers, veins, fractures, inclusions, crystalline pattern and surface contour may record a prolonged history of formation. A stone does not grow like a bud, but it may contain a concealed structure that becomes visible through fracture, sectioning, erosion or surface alteration.

It is for this reason that the stone is comparable with the bud at the level of closure. The bud conceals a future flower. The stone conceals the internal time of matter. The bud contains layers that will be opened biologically. The stone contains layers, veins, inclusions or crystalline structures that may be revealed geologically or mechanically. The bud possesses a shell that

protects and holds its internal order. The stone possesses a surface, rind, external form or weathering crust behind which another structure may be concealed. The bud opens from within through growth. The stone does not open by itself, but through fracture, erosion, chipping, polishing, destruction, exposure or natural weathering. The difference between the mechanisms is extreme, yet the morphological relationship 'external closure—internal structure—manifestation through opening or fracture' remains comparable.

The stone is especially important to an understanding of internal tension. Within a biological bud, tension is associated with growth and future opening. Within a stone, tension may be mechanical, tectonic, thermal, crystallisation-related, sedimentary or residual. Fractures in stone are often not arbitrary lines. They may indicate directions of pressure, cooling, compression, expansion, impact, changes in moisture, compositional heterogeneity or internal structure. Mineral veins may reveal pathways through which solutions penetrated and subsequently crystallised. Layering may record a sequence in the accumulation of matter. Inclusions may preserve traces of former conditions. Like the bud, therefore, the stone is a form in which the visible does not exhaust the internal.

Stones whose internal structure becomes apparent only after the surface has been opened are especially revealing. A geode, for example, may externally appear to be an ordinary stone body while containing a crystalline cavity within. A layered rock may reveal its order in section. Agate or jasper may display concentric, undulating or banded structures only after polishing. A metamorphic rock may reveal folds, stress lines and mineral orientation. Externally, a stone may be closed, rough and opaque, yet internally it may contain a complex, at times almost 'floral' or shell-like morphology. Such resemblance does not imply the biologisation of stone. It means that a closed form may conceal a more complex internal organisation than its external contour suggests.

In this respect, the stone occupies an intermediate position between the bud and the planetary structure. It is no longer a living object, yet it remains accessible to direct observation, fracture, sectioning and tactile experience. It demonstrates that the closure of form is not an exclusively biological phenomenon. Inanimate matter also contains bodies whose external surfaces conceal internal layers, tensions, cavities, crystalline structures, boundaries and traces of time. The stone demonstrates a slow, inorganic memory of form. If the bud reveals a concealed future, the stone reveals a concealed past. In both cases, however, the external form contains more than is immediately visible.

The third element of the triad—the planetary structure—transfers the analysis of closed form to the cosmic and geophysical scale. Here, a planetary structure should be understood not simply as a planet considered as an abstract astronomical object, but as the morphologically expressed organisation of a planetary body or its surface: sphericity, shell-like organisation, crust, internal layers, core, mantle, faults, craters, tectonic lines, volcanic domes, icy shells, fracture systems, impact basins, ring structures or planetary envelopes. Such a structure may belong to a planet, satellite, asteroid, dwarf planet or large planetary fragment. What matters is not the designation of the object, but the principle itself: a planetary body is often a closed or shell-like form concealing tensions, layers and processes that manifest themselves only partially upon its surface.

Like the stone, the planetary body does not open biologically. It may, however, demonstrate a shell-like organisation. A planet possesses a surface, crust and internal layers, and may also possess an atmosphere, magnetic field, lithosphere, mantle and core. Even when these

elements are not directly visible, they manifest themselves through the gravitational field, volcanism, tectonics, heat flow, seismic data, craters, fractures, surface deformations, isostatic processes, mountain systems, rifts and traces of internal activity. Externally, a planet is enclosed as a rounded body, but its form is not an empty sphere. It results from the prolonged interaction of gravity, rotation, accretion, differentiation of matter, cooling, impact events, internal heat and surface processes.

If the bud conceals the flower and the stone conceals the geological memory of matter, the planetary structure conceals the large-scale internal dynamics of a body. The surface of a planet or satellite is the boundary between the internal and external. It may appear to be a completed shell, yet traces of internal stresses emerge upon it: fractures, rifts, folds, volcanic forms, domes, ring structures, impact basins, ice fractures, mountain systems, lava plains and tectonic bands. These forms are 'windows' into the internal process. They demonstrate that the closed planetary shell is not immobile. It is under tension; it deforms, fractures, restructures, cools, is sometimes renewed and partially reveals its internal history.

The category of the shell is especially important within a planetary structure. Here, the shell is not merely an external boundary, but a morphological principle of organisation. In the bud, the shell consists of sepals and external layers holding the inner flower together. In the stone, the shell may be the surface, weathering crust, outer layer, mineral rind or simply the closed contour of the body. In the planetary structure, the shell may be the crust, lithosphere, ice cover, atmosphere or outer surface of the body. In all three cases, the shell performs a dual function: it encloses while simultaneously conveying information about the internal. It conceals the structure, yet its deformations, fractures, ruptures, folds and changes in colour enable us to infer what is occurring or has occurred within.

Internal tension within a planetary structure possesses a different scale and nature from that of the bud or stone. It may be associated with thermal evolution, radioactive decay, tidal forces, gravitational differentiation, cooling, compression, expansion, impact events, rotation, changes within the crust, mantle convection, the movement of lithospheric plates or local processes within an icy shell. Morphologically, however, this tension may manifest itself through rupture lines, ring structures, folded zones, domes, fractures, ridges, depressions, craters and regions of extension. The planetary surface becomes a map of internal tension. It does not open like a petal, but it may fracture, separate, expose, deform, swell or collapse.

It is here that the triad acquires particular depth. The bud, stone and planetary structure demonstrate three types of closure. The biological closure of the bud is directed towards the future: it contains the opening that is to come. The lithological closure of the stone is directed towards the past: it preserves the history of formation, pressure and matter. Planetary closure combines the past with a continuing process: the surface of a planetary body preserves the history of accretion, impacts, cooling, tectonics, volcanism, erosion or ice dynamics, while simultaneously remaining an area of continuing tension. In every case, closed form is not equivalent to immobility. It is the temporarily stabilised shell of a process.

Gradual opening likewise has three different meanings within this triad. In the bud, opening is organic and functional: it leads to flowering, interaction with the environment and reproduction. In the stone, opening may be either natural or externally induced: fracture, weathering, erosion, chipping, sectioning, surface destruction or the exposure of a stratum makes the internal structure visible. In a planetary body, opening may be geophysical: fractures, rifts, volcanism, craters, tectonic movements, erosional exposure, ice ruptures or impact events allow internal or

deeper structures to manifest themselves at the surface. Opening, therefore, does not always mean gentle unfolding. It may take the form of growth, rupture, excavation, exposure, destruction or deformation.

This expansion of the concept of opening demands caution. It is not possible to say that a stone ‘opens’ in the same sense as a bud. Nor is it possible to say that a planet ‘flowers’ or that its craters are petals. Such formulations would be metaphorically attractive but scientifically vulnerable. It is more accurate to say that a common morphological scenario may be identified within the three objects: a closed or shell-like form contains an internal structure; tension accumulates or is preserved within it; and under certain conditions, the structure manifests itself through opening, fracture, cracking, erosion, deformation, exposure or the transition of the surface into a new configuration. It is this scenario, rather than a poetic analogy, that forms the basis of the triad.

The comparison of the bud, stone and planetary structure allows the concept of concealed form to be refined. Concealed form is not an absence of form, but a form that is not yet accessible to direct external observation. In the bud, concealed form belongs to the future flower. In the stone, it belongs to internal layers, crystals, veins, cavities or traces of pressure. In the planetary structure, concealed form belongs to the internal shells, core, mantle, crust, lithospheric stresses, deep-seated processes or history of impacts and differentiation. In every case, the outer shell does not exhaust the object. It is a surface behind which a more complex order exists.

This idea is important to the entire hypothesis of the Unified Matrix of the Universe. The Matrix should not be understood solely as a visible pattern. If analysis is confined to the visible, it can reveal only the external resemblance of forms. Yet many morphogenetic invariants manifest themselves precisely through the relationship between the visible and the concealed. The centre may be hidden. The axis may be internal. Layers may remain invisible until sectioning. Tension may manifest itself only through a fracture. A closed form may contain a future or past structure. Comparative morphology must therefore account not only for the surface, but also for the depth of form. The bud, stone and planetary structure are especially suitable objects for such an analysis because each of them reveals the boundary between the external and internal.

In the bud, this boundary is soft and biological. The outer layers of the bud gradually separate; the internal elements become visible; and the closed shell is transformed into an open composition. In the stone, the boundary is more rigid. The external surface may need to be destroyed, fractured or exposed in order to reveal the internal structure. In a planetary body, the boundary is larger still: the surface may be disrupted by a crater, rift, volcano, tectonic band, ice fracture or erosional section. The higher the level, the less direct the opening becomes. Yet the logic ‘surface — concealed structure — manifestation through tension’ persists.

A visual illustration of this triad may be constructed as a comparison among three closed or shell-like forms: a bud, a stone with a visible internal structure or fracture, and a planetary body or its surface with fractures, craters, rifts or shell-like organisation (*Fig. 3*). Such an illustration requires particular caution. It should not depict a planet as a flower or transform a stone into a living organism. Its purpose is to demonstrate three features: a closed contour, internal tension and a line of possible opening or fracture. The image would then perform an analytical function, enabling the reader to see that a closed form may be not an empty shell, but the bearer of a concealed structure.

Within this triad, it is especially important to distinguish between external smoothness and internal complexity. A bud may possess a smooth outer contour while containing a complex

arrangement of petals and organs. A stone may have a simple rounded form while containing crystalline cavities, layers, veins and inclusions. A planetary body may appear to be an almost perfect sphere while possessing complex internal differentiation and bearing upon its surface the traces of impacts, faults, volcanism, folding or ice dynamics. The simplicity of the external contour often conceals the complexity of the internal order. This is one of the principal conclusions of the section.

This relationship between the external and internal makes it possible to connect the triad with the philosophical category of potentiality. In the bud, potentiality is evident: the future flower exists as a possibility that is destined to open. In the stone, potentiality has a different character: the stone does not 'strive' to open, but its internal structure may potentially be revealed to observation through sectioning, fracture or erosion. In the planetary structure, potentiality is associated with the possibility that internal processes will manifest themselves at the surface: volcanism, tectonics, fracture formation, cratering or deformation may translate concealed dynamics into visible form. Potentiality within this triad is therefore not uniform in meaning. It is biological in the bud, structural and geological in the stone, and geophysical in the planetary body.

The category of internal tension connects this potentiality with process. Potentiality does not become form without tension, a gradient, an influence or a change in conditions. In the bud, growth processes create pressure and a biomechanical readiness for opening. In the stone, internal tension may persist as a trace of pressure, cooling or deformation and manifest itself through fractures. In the planetary structure, tension may be caused by internal heat, tidal forces, compression, impact or crustal movement. In each case, tension mediates between the concealed structure and its manifestation. Without tension, a closed form might remain immobile. Through tension, it begins to reveal its internal order.

Tension, however, does not always lead to harmonious opening. In the bud, it is usually incorporated into the normal biological cycle. In the stone, it may lead to destruction. In the planetary structure, it may cause a catastrophic event, faulting, an impact crater, volcanic ejection or tectonic rupture. The concept of opening within this triad must therefore remain neutral. It does not necessarily signify development towards beauty or completeness. It means the manifestation of the concealed through a change in the shell. Such manifestation may be creative, destructive, neutral or mixed. In the broad sense, morphogenesis encompasses not only growth, but also deformation, rupture, exposure and transformation.

The 'bud — stone — planetary structure' triad also makes it possible to refine the concept of shell-like form. A shell is not always a simple covering. It may be an active part of the system. In the bud, the outer layers not only enclose the form, but also participate in its opening. In the stone, the surface may protect the internal structure while simultaneously undergoing weathering and gradually exposing the depth. In the planetary body, the crust or outer shell not only separates the interior from the cosmic environment, but also records internal dynamics. Through the shell, the system interacts with the external: the bud with air, moisture, light and mechanical influences; the stone with temperature, water, pressure and the chemical environment; and the planetary body with impacts, radiation, atmosphere, tidal forces and the cosmic environment. The shell is the site at which the internal and external meet.

If this triad is considered through the prism of the centre, another important feature becomes apparent. The centre of the bud is concealed within. It becomes visible only after the flower has opened. In the stone, the centre may be geometric or structural, or it may be absent as a single

point; sometimes an internal cavity, crystalline core, inclusion or zone of layering performs the role of a concealed centre. In the planetary body, the centre possesses a physical meaning as the centre of mass, core, gravitational region or zone of internal differentiation, but morphologically it may manifest itself only indirectly—through sphericity, gravitational equilibrium, radial structure, internal shells or surface forms. Within closed forms, therefore, the centre is often invisible while organising the object from within.

Stage-based development also finds different expressions within the triad. The bud passes through observable stages of biological opening. A stone may not possess ‘stages’ in a living sense, but its structure records a sequence of geological events: deposition, crystallisation, pressure, metamorphism, fracture formation and weathering. The planetary structure preserves an even larger-scale history: accretion, differentiation, cooling, impact reworking, tectonic activity, volcanism, erosion, ice processes and atmospheric influence. In all three cases, form is not merely a current state, but an archive of stages. The bud contains the immediate future, the stone a deep past, and the planetary structure the history of a body together with its potentially continuing dynamics.

It is especially important that this triad transfers the idea of the Matrix from the realm of open beauty to that of the concealed and tension-filled. This is essential to the scientific seriousness of the hypothesis. If the analysis were confined to flowers, nebulae and striking radial forms, the hypothesis might appear merely aesthetic. The inclusion of the bud, stone and planetary structure demonstrates that the subject is not limited to beautiful open contours. It concerns a deeper morphogenetic question: how does form preserve its internal organisation before it manifests itself? How does the shell contain tension? How does the concealed become visible? How does a surface communicate a deep-seated structure? How do a fracture, opening or crack become signs of internal order?

The answers to these questions are important to the future testing of the hypothesis. Closed forms may be analysed morphometrically through the degree of roundness, contour closure, the relationship between the shell and internal structure, the character of fractures, the orientation of rupture lines, the nesting of layers, the distribution of cavities and the relationship between the surface and the internal pattern. In the bud, it is possible to analyse the form of the closed contour, the number and arrangement of outer elements, the lines of future opening, symmetry and asymmetry. In the stone, one may examine layering, fracturing, crystalline structure, cavities, concentric zones, veins and the form of the fracture. On a planetary surface, one may analyse crater density, rift lines, ring structures, fault distribution, shell-like organisation, the tectonic network, volcanic domes and ice fractures. Even closed form may therefore be translated into a language of features.

The method must also account for differences in the accessibility of internal structure. The bud may be observed dynamically as it grows and opens. The stone may be fractured, cut, examined in thin section and investigated mineralogically. A planetary structure generally cannot be opened directly; its internal organisation is reconstructed from indirect data: gravity, magnetic fields, seismic observations, spectral analysis, topography, density, heat flow, models and surface images. This distinction is important. It demonstrates that the same morphological question requires different methods at different levels. Comparative morphology does not replace these methods, but connects them through a shared problem of form.

In this sense, the ‘bud—stone—planetary structure’ triad demonstrates particularly clearly the need for interdisciplinary caution. The biologist must describe the bud as a plant organ. The

geologist must describe the stone as the result of lithological and mineralogical processes. The planetary scientist must describe the planetary structure through geophysics, astronomy, cosmochemistry and the dynamics of celestial bodies. The philosopher of form may compare them only after acknowledging the autonomy of each explanation. The triad then becomes not an oversimplification, but an additional level of analysis: it demonstrates that different disciplines address different objects, yet sometimes encounter the common problem of concealed structure, the shell and the manifestation of internal tension.

Visually, this triad may be less obvious than the previous ones, but conceptually it is deeper. The flower and nebula attract the eye through their open form. The leaf and valley persuade through their axial network. The bud, stone and planetary structure demand a more attentive reading: it is necessary to perceive not only what is open, but also what is concealed. The external contour is important precisely because it does not reveal everything. It forms the boundary of a hidden internal organisation, but this 'mystery' must be understood structurally rather than mystically. The concealed consists of internal layers, tensions, lines of future opening, faults, cores, cavities, shells and traces of time.

This triad also helps to refine the relationship between closure and opening. Within the hypothesis of the Unified Matrix of the Universe, closed form is not opposed to open form as the dead is opposed to the living or the static to the dynamic. Closure is a phase of morphogenesis. It may be a necessary condition for accumulation, protection, stabilisation or preparation. The bud must remain closed in order to preserve the future flower. The stone preserves its internal structure through its bodily closure and stability. The planetary body maintains its internal layers and gravitational integrity through its shell-like organisation. Opening is possible only because it was preceded by a state of concentration. Without closed form, there would be nothing to become visible.

At the same time, closure may become a limit. If a bud does not open, its morphogenetic cycle is disrupted. If a stone remains completely closed, its internal structure remains inaccessible to observation. If a planetary surface bears no traces of internal dynamics, its deep-seated history must be reconstructed indirectly. Within comparative morphology, therefore, it is important to perceive not only closure as stability, but also the transition across the boundary of closure. The line of opening, crack, fracture, crater, seam, edge, cavity and section are all forms of transition from the internal to the external. They enable concealed order to become visible.

Thus, the 'bud—stone—planetary structure' triad makes it possible to identify a distinctive type of morphological organisation that may be called the model of the closed tension-filled form. This model includes several features: a closed or shell-like contour, a concealed internal structure, the presence of layers or nesting, internal tension, the surface as a boundary, a line of potential opening or rupture, and the gradual manifestation of internal order. In biology, this model manifests itself through the bud. In geology, it appears through the stone, especially one that is layered, crystalline, fractured or hollow. At the planetary scale, it is expressed through a planet, satellite or planetary surface as a shell-like structure possessing internal dynamics and external traces of tension.

This model neither replaces the radial-layered model of the flower and nebula nor the axial-network model of the leaf and valley. It complements them. Together, the three models demonstrate that the hypothesis of the Unified Matrix of the Universe must address several modes of form. The first mode is opening from the centre towards the periphery. The second is distribution along an axis and through a network. The third is a concealed structure within a

closed shell. These modes may pass into one another. A bud may become a flower. A stone may reveal its layers and fracture lines. A planetary shell may manifest its interior through fractures, craters, volcanism or tectonics. Closed form is therefore not an isolated motif; it is a phase of the general morphogenetic cycle.

Ultimately, the 'bud—stone—planetary structure' triad demonstrates that comparative morphology must be capable of analysing not only visible resemblance, but also concealed organisation. It teaches us to perceive form as a tension-filled shell, a bearer of internal memory and a boundary between the potential and the manifested. The bud represents the biological future of form. The stone represents the geological memory of matter. The planetary structure represents shell-like organisation on a cosmic scale, within which internal dynamics manifest themselves through the surface. There is no direct causal identity between them, but there is a recurrent morphological problem: how closed form contains, preserves and gradually reveals internal order.

This is why the triad is necessary to the serious development of the hypothesis. It prevents the Matrix from being reduced to a collection of beautiful open images. It demonstrates that universal invariants may be associated not only with radiality, branching and self-similarity, but also with closure, the shell, internal tension, concealed layering and the line of opening. If these features are described, classified and subsequently tested across different materials, the hypothesis will acquire a deeper foundation. It will address not merely the fact that forms sometimes resemble one another, but the possibility that different levels of matter preserve and manifest structure through comparable morphogenetic relationships: internal—external, shell—core, tension—fracture, closure—opening, concealed—manifested.

17.5. The Significance of Comparative Morphology

Comparative morphology occupies a special place within the hypothesis of the Unified Matrix of the Universe. It is neither a simple illustration of an already formulated idea nor definitive proof of its truth. Its significance lies elsewhere: it creates an intermediate level of research between the philosophical formulation of the problem and rigorous scientific testing. At this level, visual observation is transformed into feature-based analysis, external resemblance into a question concerning morphological invariants, and individual images of nature into material for classification, comparison and possible formalisation.

The principal methodological danger in working with forms from different levels is the temptation to draw premature conclusions. A flower may indeed resemble a nebula, a leaf a valley network, and a bud a stone or planetary body. Such resemblance, however, proves nothing in itself. Human perception is inclined to recognise familiar images within complex structures. We may see a face in a cloud, a tree in lightning, a flower in a cosmic image, a vascular network in a map of rivers, or petals in the folds of relief. This perceptual ability is important because it often becomes the starting point of a scientific question. Yet it may also become a source of error when an impression is treated as evidence.

Comparative morphology should therefore begin not with the assertion that 'the objects are similar', but with the more rigorous question: which specific features recur within them? If the resemblance is confined to a general visual association, it remains weak. If recurrent structural relationships can be identified within different objects—centre and periphery, axis and lateral

branches, layer and shell, closed form and opening, edge and environment, branching and self-similarity—then a subject for analysis emerges. Comparative morphology does not eliminate the need for caution, but it enables a visual observation to be translated into a scientifically discussable form.

This is precisely the significance of the BIO–GEO–COS triads examined in this chapter. The 'flower—relief —nebula' triad demonstrated the radial-layered model: centre, periphery, active edge, shells, layers and the process of opening. The 'leaf—valley—cosmic shell' triad revealed the axial-network model: a principal line, lateral branching, recurrent boundaries, surface and hierarchy of scale. The 'bud—stone—planetary structure' triad made it possible to identify the model of the closed tension-filled form: a shell, concealed internal structure, internal tension and a line of opening, fracture or manifestation. These three models do not exhaust all the possible material of the hypothesis, but they demonstrate that comparative morphology can address different modes of form.

It is especially important that each of these triads preserves the distinction between levels. The flower remains a biological form, relief a geological form and the nebula an astrophysical form. The leaf does not become a valley, the valley a leaf, or the cosmic shell a plant organ. The bud does not make the stone alive or the planetary structure biological. This distinction is the foundation of scientific correctness. Comparison is permissible only when the researcher clearly understands that what is being compared is not the mechanisms of origin, but morphological relationships. The mechanisms remain different; the features of organisation become comparable.

This distinction makes it possible to avoid two extremes. The first is the rejection of comparison merely because the objects belong to different disciplines. In this case, science preserves its rigour but loses the opportunity to perceive recurrent principles of form generation. The second is excessive analogisation, in which every resemblance is declared to be a manifestation of a unified law. In that case, the hypothesis becomes striking but methodologically vulnerable. Comparative morphology must pass between these extremes. It must acknowledge differences between mechanisms without closing the question of a possible commonality among structural solutions.

In this respect, comparative morphology is a discipline of boundaries. It lies between biology, geology, cosmology, mathematics, the philosophy of form and the theory of complex systems. It does not replace any of these fields. Its purpose is to create a language in which recurrent morphological features can be discussed without reducing one level to another. Biological morphogenesis explains the growth and opening of living form. Geomorphology explains relief, valleys, folds, erosion and lithological memory. Astrophysics explains nebulae, shells, ejections, gas-and-dust structures and planetary bodies. Comparative morphology asks whether there is a common structural level among these explanations at which it is possible to speak of the centre, axis, layer, edge, branching, closure, opening and self-similarity.

The answer to this question cannot be provided through philosophy alone. Philosophy helps us perceive the problem of form and formulate questions concerning wholeness, potentiality, becoming, the concealed and the manifested. Yet philosophical interpretation does not in itself prove the recurrence of invariants. This requires procedures: description, classification, measurement, comparison and testing upon independent samples. Comparative morphology should become the level at which the philosophical question acquires an analytical form. It does not complete the proof, but makes the hypothesis suitable for further scientific consideration.

Visual resemblance must therefore be regarded as an initial signal rather than a conclusion. It may indicate a possible invariant, but must subsequently be decomposed into features. If a flower and a nebula appear similar, it is necessary to determine exactly where the resemblance lies: in radiality, layering, shell-like organisation, the active edge, the transition from centre to periphery, or in some other feature. If a leaf and a valley appear analogous, the analysis should address the axis, lateral branches, the hierarchy of lines, the network of boundaries, fractality or quasi-fractality. If a bud, stone and planetary body are compared as closed forms, it is necessary to identify the shell, internal structure, tension and the line of fracture or opening. Without such analysis, resemblance remains an impression. Through analysis, it becomes a research hypothesis.

Comparative morphology also makes it possible to refine the concept of the invariant. An invariant is not an identical object, identical form or identical physical mechanism. It is a recurrent organisational principle that may be realised through different materials, scales and processes. The centre of a flower, an area of uplift within relief, a luminous region of a nebula and the core of a planetary body are not the same object. Each may nevertheless perform an organising function. The axis of a leaf, the line of a valley and the direction of cosmic ejection do not share a single nature, but may establish the direction of form. The edge of a petal, the edge of a plateau, the front of a nebula and a fracture in a planetary surface are different, yet each marks a zone in which an internal structure interacts with its environment. It is precisely this functional and structural recurrence that should be regarded as a possible invariant.

This understanding of the invariant makes the hypothesis both more cautious and stronger. It is more cautious because it does not assert the literal unity of all forms. It is stronger because it seeks not external identity, but a deeper recurrence of relationships. Externally, a flower, stone, valley, nebula and planetary surface may be extremely different. Yet if the relationships ‘centre—periphery’, ‘axis—lateral branching’, ‘shell—internal tension’, ‘edge—environment’ and ‘concealed structure — manifested form’ recur within them, a basis for systematic comparison emerges. This basis does not constitute definitive proof of the Matrix, but it moves the hypothesis beyond the realm of free metaphor.

Comparative morphology is especially significant because it makes it possible to work with form as a process. If form is regarded solely as an external contour, comparison inevitably remains superficial. The situation changes, however, when form is understood as the trace of becoming. The flower preserves the memory of the bud and the transition towards opening. Relief preserves the memory of pressure, erosion, folding and time. The nebula bears the trace of expansion, ejection and the interaction of gas, dust and radiation. The leaf demonstrates the development of a conducting network and surface. The valley records the history of drainage and the dissection of the Earth’s surface. The stone preserves the memory of matter, pressure, crystallisation or fracture. The planetary structure retains traces of accretion, impacts, cooling, tectonics, volcanism and internal tension. In every case, form becomes not an image, but a document of process.

It is precisely this processual character that allows morphogenesis to be discussed in an expanded sense. Biological morphogenesis remains a specifically biological process. Geological form generation is not the growth of a living organism. Cosmic structure is not organic development. At the level of comparative morphology, however, it is possible to ask a more general question: how does a more pronounced structure arise from a less differentiated state? How does a closed form become an open one? How does an axis generate a lateral network? How

does a layer record a phase of development? How does the edge become a zone of maximum tension? How does a concealed internal organisation become visible upon the surface? These questions do not erase the distinctions among the sciences, but allow a common language of form to become visible.

In this sense, comparative morphology provides a means of moving from individual images to an atlas of forms. As long as the researcher works with isolated comparisons, the hypothesis remains dependent upon the quality of the selected examples. The situation changes when an atlas of morphogenetic forms is created. Large collections of images of biological, geological and cosmic structures may be assembled. They may be grouped according to their leading features: radial, axial, networked, layered, shell-like, spiral and closed forms; forms of opening; and forms with an active edge. Rather than comparing a single flower with a single nebula, it becomes possible to compare classes of objects. The hypothesis then begins to move from a visual sequence towards a research database.

The next step after the atlas should be the creation of a classifier of invariants. Within such a classifier, each object could be described through a set of features: the presence of a centre, type of axis, degree of symmetry, character of asymmetry, layering, branching, radiality, spirality, edge complexity, shell-like organisation, closure, opening, self-similarity, stage-based development and visible internal tension. The degree to which each feature is expressed could be recorded as strong, moderate, weak, disputed or absent. This approach would allow analysis to move beyond the binary judgement ‘similar—dissimilar’. Natural form is almost always more complex. One object may possess pronounced layering, weak radiality and a clearly active edge. Another may have a strong axis, developed branching and weak shell-like organisation. A third may demonstrate a closed form, internal tension and an almost entirely absent network. It is precisely such combinations of features that should become the subject of analysis.

Comparative morphology also opens a path towards morphometrics. Centredness may be analysed through the distribution of elements relative to a central region. The axis may be investigated through the dominant direction of form. Radiality may be assessed through the angles and directions of diverging elements. Branching may be examined through branch order, divergence angles, lengths, network density and hierarchy. Layering may be analysed through the number of levels, their nesting, recurrence and contrast. The edge may be assessed through dissection, fractal dimension, waviness, discontinuity and curvature. Shell-like organisation may be examined through the relationship between internal and external zones. Closure may be assessed through the degree to which a contour is enclosed. Opening may be analysed through changes in form over time or through the reconstruction of stages. Such parameters do not replace qualitative analysis, but make it more rigorous.

Fractal analysis is particularly promising. Many natural forms are not fractals in the ideal mathematical sense, yet they demonstrate scale-dependent recurrence, self-similarity or quasi-fractal organisation. Leaf venation, river and valley networks, coastlines, fractures, mountain folds, cloud contours, nebulae and filamentary cosmic structures may be studied through fractal dimension, scale dependence, branching hierarchy and edge complexity. If comparable types of organisation across scales are found within different classes of objects, this will not automatically prove the Matrix hypothesis, but it will provide it with a more substantial empirical foundation. Comparative morphology would then become not only visual, but also quantitative.

Quantitative analysis, however, should not destroy the philosophical depth of the question. A number alone does not explain form completely. The fractal dimension of an edge may be

calculated, but it does not answer the question of why that edge is the zone of contact between a system and its environment. A branching angle may be measured, but it does not exhaust the significance of the transition from a principal axis to multiple directions. Layering may be classified, yet it also remains the memory of a process. Comparative morphology must therefore unite two levels: the measurable and the interpretative. The measurable level helps to test features. The interpretative level helps to understand their role within the general logic of form.

The significance of comparative morphology also lies in its ability to discipline the hypothesis itself. Every large interdisciplinary idea requires protection against excessive expansion. If a hypothesis explains everything, it risks ceasing to explain anything in particular. Comparative morphology introduces limitations. It requires the researcher to specify which features are being examined, why particular objects have been selected, how strongly the resemblance is expressed, which differences remain, which alternative explanations are possible, and which cases do not fit the model. This is especially important if the scientific community is to take the study seriously. A serious hypothesis must not only present supporting examples, but also acknowledge the limits of its own applicability.

Negative and borderline cases should therefore be included within the future research programme. Not every flower provides a good model of radial opening. Not every relief demonstrates layering or centredness. Not every nebula possesses a pronounced shell. Not every leaf has complex branching. Not every valley resembles a leaf network. Not every stone reveals an internal structure. Not every planetary body displays active internal tension upon its surface. If such cases are excluded in advance, the analysis becomes biased. If they are described, however, the hypothesis gains the opportunity to become more precise. Some invariants may prove more universal, others limited, and still others characteristic only of particular classes of systems.

Comparative morphology must also address the problem of image selection. Visual material may be extremely persuasive, yet it always depends upon viewpoint, scale, illumination, processing, colour coding, resolution, the instrument of observation and the method by which data are presented. This is especially true of cosmic images, which are frequently produced through the processing of data from different ranges of radiation. Geological relief may likewise appear very different in a photograph, satellite image, topographical map or digital elevation model. A biological object changes according to its stage of development, species, growth conditions and angle of observation. Comparative morphology must therefore work not with a ‘beautiful picture’, but with a documented image that clearly identifies the object, its scale, the purpose of the image and the feature being analysed.

This will require the creation of rigorous rules for the visual corpus. For each image, it will be necessary to record its source, type of object, scale, viewpoint, stage of development or process, leading features, level of reliability, method of processing and interpretative limitations. Only then will an atlas of forms be able to function as a scientific instrument. Otherwise, it will remain a collection of striking analogies. The hypothesis of the Unified Matrix of the Universe requires the former: a corpus that can be tested, criticised, expanded, refined and used for independent analysis.

Another important task of comparative morphology is to distinguish the universal from the typical. Not every recurrent feature is universal. Certain features may characterise a broad class of forms without being present at every level. Radiality is pronounced in flowers, certain relief structures and some nebulae, but is not obligatory for all natural structures. Branching is widespread in

plants, river systems, fractures and networks, but is not always expressed within shell-like or spherical forms. Layering is characteristic of buds, rocks, shells and planetary structures, but may be absent from other objects. Comparative morphology should therefore discuss not simple absolute universality, but the distribution of invariants among classes of forms. This is a more precise and scientifically productive approach.

Such an approach makes it possible to conceive of the Matrix not as a single static template, but as a system of morphogenetic operations. These operations may include centring, axial direction, branching, layering, closure, opening, edge formation, shell-like organisation, spiral displacement, self-similar recurrence, the transition from the concealed to the manifested, and cyclical return to a new potential form. These operations combine differently within different objects. The flower emphasises opening, the centre and radiality. The leaf emphasises the axis, network and edge. The stone emphasises closure, internal structure and fracture. Relief emphasises the layer, fold, valley and boundary. The nebula emphasises shell-like organisation, the edge, expansion and filamentation. The planetary structure emphasises closure, internal tension and the manifestation of depth upon the surface. In this sense, the Matrix may be understood not as a visual form, but as a grammar of form generation.

The concept of grammar is especially important here. In language, grammar does not compel every sentence to be identical. It establishes rules according to which different utterances can arise. Similarly, a morphogenetic grammar should not produce identical objects. It may establish a limited set of structural possibilities realised through different materials and scales. The centre, axis, layer, edge, branching, shell, opening, spiral and self-similarity may be elements of such a grammar. Their combinations create a diversity of forms. The hypothesis of the Unified Matrix of the Universe thereby acquires a more mature interpretation: it is not that the entire world repeats a single image, but that different systems may employ comparable principles of organisation.

It is comparative morphology that makes the transition to this understanding possible. Without it, the Matrix might remain a philosophical image. Through comparative morphology, it becomes a research framework. It acquires features, types, groups, models, limits of applicability and prospects for testing. The BIO–GEO–COS triads serve as the first nodes of this framework. They demonstrate that the purpose is not to compare everything with everything else, but to compare specific complexes of features: radial-layered, axial-networked and shell-like tension-filled complexes. Further complexes may subsequently be identified. It may be possible to speak of spiral, fractal, tree-like, wave-like, ring-shaped and fracture-based triads, as well as structural triads tracing the transition from core to periphery. Yet the same principle must always be preserved: features first, comparison second, testing third.

Comparative morphology also possesses heuristic value. It helps reveal connections where disciplinary thinking usually perceives only difference. A biologist may not compare a leaf with a valley system because their mechanisms are different. A geologist may see no connection between folded relief and the layered organisation of a bud. An astrophysicist does not require an analogy between a nebula and a flower in order to explain gas-and-dust dynamics. An interdisciplinary perspective, however, can formulate a different question: why do comparable methods of organising space arise within systems governed by different mechanisms? Such a question does not replace the individual sciences, but may create new directions for research—for example, the comparative analysis of branching, boundaries, layering, shells and marginal zones.

Heuristic value must not, however, replace evidential rigour. A new idea often begins with an analogy, but becomes mature only after testing. Comparative morphology may propose hypotheses: e.g., that the active edge is one of the most stable features of developing forms; that layering frequently indicates the memory of a process; that the axis and branching arise as means of distributing flows or stresses; that shell-like organisation is connected with the relationship between the internal and external; and that a closed form frequently contains concealed structural potential. Yet each such hypothesis must be tested against evidence. This is the path from a visual idea to a scientific programme.

The most important conclusion of the chapter is the recognition of the dual status of visual resemblance. On the one hand, it cannot be regarded as proof. It is too dependent upon perception, the selection of examples and the conditions under which an image is produced. On the other hand, it cannot be rejected entirely as something unscientific. Many scientific discoveries began with the observation of form, pattern, symmetry, recurrence, anomaly or unexpected resemblance. Visual thinking plays an important role in biology, geology, astronomy, anatomy, crystallography, cartography, mathematics and the theory of complex systems. The problem does not lie in the researcher perceiving a resemblance. It arises when the researcher does not know how to test it. Comparative morphology offers a means of conducting such a test.

This method can be expressed as a sequence of steps. First, the visual observation is recorded. Specific features are then identified. The object is subsequently described within its own disciplinary context. After this, its features are compared with those of objects at other levels. Correspondences, differences, weaknesses and limitations are then documented. A feature matrix is subsequently created. Morphometric, fractal, network, statistical or modelling research may then be undertaken. This sequence allows the hypothesis to move from image to procedure. It is precisely this movement that makes it potentially worthy of serious scientific discussion.

Comparative morphology is also important because it allows the limits of the hypothesis's provability to be formulated more clearly. The Unified Matrix of the Universe cannot be proven through a single sequence of images. It cannot be proven by the fact that several objects look similar. Nor can it be proven by the symbolic power of images. Individual propositions can, however, be tested gradually. Do particular invariants genuinely recur within independent samples? Can they be measured statistically? Do they occur more frequently than would be expected by chance? Do they form stable complexes? Are these complexes associated with particular types of processes? Can their emergence be modelled through known mechanisms of self-organisation, growth, deformation, branching or dispersion? If the answers to even some of these questions are positive, the hypothesis will acquire a more rigorous status.

Partial testability is therefore crucial. The hypothesis in its full philosophical scope cannot be tested all at once. Individual features, models and sequences may nevertheless be testable. The fractal complexity of edges can be assessed. Branching hierarchies can be compared. Radiality and the degree of symmetry can be analysed. Layering and shell-like organisation can be described. Morphological transitions from closed to open forms can be investigated. Certain processes can be modelled using L-systems, reaction–diffusion models, growth algorithms, and models of fracture formation, erosion, gas dynamics or the distribution of matter. Comparative morphology supplies material for such tasks. It is therefore not the conclusion of the research, but preparation for its methodological and experimental sections.

The significance of comparative morphology within the hypothesis of the Unified Matrix of the Universe may consequently be formulated through several propositions. First, it makes it

possible to identify recurrent features of form at different levels of matter. Second, it translates visual resemblance into feature-based analysis. Third, it preserves the differences among mechanisms and thereby protects the hypothesis from pseudoscientific analogisation. Fourth, it establishes a foundation for an atlas of forms and a classifier of invariants. Fifth, it prepares the ground for morphometrics, fractal analysis and statistical testing. Sixth, it expands the philosophical understanding of form as the trace of a process, the memory of becoming and the relationship between the internal and external.

This constitutes the scientific significance of the material presented here. It does not prove the hypothesis conclusively, but demonstrates how the hypothesis may be placed upon a more rigorous path. Before this chapter, the biological, geological and cosmic levels were considered separately. Here, for the first time, they have been compared systematically through the method of visual triads. This is neither the mechanical unification of three fields nor an arbitrary association of objects. It is an attempt to create a comparative morphology of levels in which every object retains its own nature while participating in a shared analysis of form.

Comparative morphology is thus one of the central instruments in the transition from hypothesis to scientific programme. It demonstrates that the Unified Matrix of the Universe should not be understood as a mystical image imposed upon nature from outside. If the concept possesses research significance, this must be revealed through recurrent morphological invariants that can be described, classified and tested. Visual resemblance does not prove the hypothesis in itself. It does, however, make it possible to perceive features that may become the subject of rigorous analysis. Comparative morphology is therefore not a weakness of the study. When supported by an appropriate methodology, it becomes one of its strengths: a disciplined bridge between image, form, model and future testing.

This completes the cosmic section of the study while simultaneously preparing the transition to the cultural and symbolic level of the Matrix. Following the analysis of natural, geological and cosmic triads, it becomes possible to turn to artefacts, the World Tree, Sumerian reliefs, sacred geometry and other cultural forms. This transition, however, must be approached with even greater caution. If the natural levels require mechanisms to be distinguished, the cultural level requires a distinction between nature and symbol, between the empirical object and its human interpretation. The experience of this part of the study is therefore especially important: it demonstrates that every comparison must proceed through features, limitations and methodological discipline. Only then will the hypothesis of the Unified Matrix of the Universe be able to advance from natural comparative morphology to the analysis of cultural forms as possible records of morphogenetic schemes.

Fig. 1. Triad “Flower — Relief — Nebula”: Layering, Active Margin, Radiality, and Unfolding as Comparable Morphological Features across Different Levels

Fig. 2. Triad “Leaf — Valley — Cosmic Shell”: Axis, Lateral Branching, and Recurrent Boundaries as Features of Axial-Network Morphological Organisation

Fig. 3. Triad “Bud — Stone — Planetary Structure”: Closed Form, Enclosure, Internal Stress, and the Gradual Manifestation of Hidden Order

Part Six

The cultural and symbolic level of the Matrix

Chapter Eighteen

The Artefact as a Record of a Morphogenetic Scheme

18.1. The Artefact Not as Myth, but as a Model of Form

The transition from the natural, geological and cosmic levels of the Matrix to its cultural and symbolic level requires particular methodological caution. Until this point, the book has examined forms arising within nature: the flower, leaf, seed, fruit, stone, mountain relief, ocean floor, nebula, and galactic and spiral structures. These objects differed in their material nature, scale, duration and causal mechanisms, yet each belonged to the world of natural processes. A different type of form now enters the field of analysis—a form created by human beings. An artefact does not grow like a plant, fold like rock, expand like a nebula or rotate like a galaxy. It arises within culture, human action, tradition, symbolic thought, ritual, artistic practice, craftsmanship, architecture, ornament and systems of signs. It cannot therefore be considered in the same way as a biological or geological object.

This distinction does not, however, mean that the artefact should be excluded from the study of form. On the contrary, the cultural artefact is especially important to the hypothesis of the Unified Matrix of the Universe because it demonstrates how human consciousness records, orders and transmits observed schemes of the world. Human beings do not merely live among natural forms; they observe them, remember them, transform them into images, translate them into signs, repeat them in ornament and preserve them in stone, metal, wood, fabric, ceramics, murals, reliefs, architectural compositions and ritual objects. In this sense, the artefact is not merely an object, but a trace of the human way of perceiving form.

Ancient artefacts are usually considered primarily as religious, mythological, ritual, magical, social, political or artistic objects. Such an approach is necessary and cannot be abandoned. Archaeology determines the material, dating, manufacturing technology, cultural context, place of discovery, function and relationships with other objects. Art history analyses style, composition, technique, canon, iconography and visual tradition. Religious studies examine cultic meaning, mythological narratives, ritual use and sacred functions. Anthropology investigates the relationship between the artefact and conceptions of the world, social organisation, power, memory and collective identity. All these levels of analysis possess their own scientific value.

Alongside them, however, another level is possible: the morphological. Its primary question is not which deity the object was dedicated to, which myth it belongs to or what function it performed within a ritual. It asks instead: what form has been recorded within it? How is its composition organised? Does it possess a centre? Does it possess an axis? Is there symmetry or a disruption of symmetry? Are there layers, radial elements, waves, zigzags, branches, spirals, circles, crescents, star-shaped structures or recurrent boundaries? Can it be read as a scheme of opening, growth, movement, flow, tension, rupture, connection or transition from the concealed

to the manifested? It is precisely this question that allows the artefact to be considered not only as a mythological sign, but also as a model of form.

The word ‘model’ must be understood cautiously here. An artefact is not a scientific model in the modern sense. An ancient craftsperson creating a vessel, seal, relief, ornament, cultic figure or geometric sign did not work with the concepts of morphogenesis, fractality, self-organisation, nonlinear dynamics or complex-systems theory. They may have thought mythologically, ritually, figuratively, symbolically, practically or aesthetically. Yet this does not exclude the possibility that the form they created recorded an observable logic of natural order. Human beings saw how a tree grew, a flower opened, water moved, a snake curved, lightning branched, clouds moved in waves, mountains formed a serrated horizon, and the sky was organised through circles, stars, celestial bodies and cyclical returns. Such observations could pass into cultural form.

An artefact may therefore be considered a visual scheme of observed order. It does not necessarily explain that order, but may preserve it. It does not necessarily prove a universal law, but may retain a morphological motif. It is not necessarily a conscious theory, but may function as a form of early structural thought. In this sense, the ancient artefact is an intermediate phenomenon between nature and concept: it is no longer the natural form itself, but neither is it yet an abstract scientific model. It represents the cultural preservation of a form perceived, experienced, interpreted and transformed by human beings.

This understanding is especially important to the hypothesis of the Unified Matrix of the Universe. Whereas the book sought recurrent morphogenetic invariants within natural objects, cultural artefacts must be examined not for physical mechanisms, but for visual representations of those invariants. The centre, axis, circle, tree, seed, flower, zigzag, wave, spiral, ray, star, nesting, symmetry, layering and opening may appear within artefacts as stable forms of cultural thought. Their presence does not mean that an ancient culture possessed a fully developed scientific theory of the Matrix. It may, however, mean that human consciousness repeatedly returned to the same structural motifs that it observed in nature, the body, relief, water, plants, the sky and the cycles of time.

A boundary must be drawn here between myth and the morphological model. Myth explains the world through narrative, images, the actions of gods, ancestors, heroes, spirits, cosmic beings and sacred events. An artefact incorporated into a mythological system may depict a figure, scene, ritual act, cosmological order or symbolic event. Yet the same object also possesses a form, and this form may be analysed independently of its particular mythological narrative. An image of a tree, for example, may belong to a myth concerning the World Tree, ancestral origin, the celestial axis or the connection among worlds. Morphologically, however, it also contains a trunk, root, branches, levels, verticality, branching and a relationship between a concealed foundation and an open crown. Mythological meaning and morphological structure do not coincide, but they may interact.

The proposition ‘the artefact not as myth, but as a model of form’ does not therefore entail a rejection of myth. It signifies a change in analytical perspective. The artefact may remain a mythological object, but within the framework of the present study it is additionally considered as a scheme of form. Its mythological function is not denied, but is temporarily placed in the background so that its morphogenetic organisation may become visible. This approach is especially important because the same morphological motif may occur within different mythological systems. The centre, axis, circle, tree, wave, zigzag or spiral may possess different

religious meanings while retaining a comparable structural role. Morphological analysis makes it possible to recognise that role.

An artefact becomes a model of form when stable relationships among its elements can be identified. Not every cultural object possesses such a status. An ordinary utilitarian object may be archaeologically important without necessarily bearing a pronounced morphogenetic scheme. Many ancient objects, however, are constructed in such a way that their form is clearly organised around a centre, axis, symmetry, rhythm, repetition, wave, serrated edge, concentric circles, nested levels, radiating elements, spirals or signs of movement. In such cases, the object may be analysed not only as a thing, but also as a visual construction recording a particular method of organising space.

The centre within an artefact may be represented by a circle, point, eye, seed, rosette, solar sign, opening, central figure, core of an ornament, compositional node or sacred region of an image. The axis may appear as a vertical line, staff, trunk, body of a figure, column, spear, stem, stream, ladder, road, central seam, symmetrical vertical or a line connecting the upper and lower regions. Layering may be expressed through bands, registers, recurrent levels, concentric circles, shells, frames, borders or nested figures. Branching may be depicted through trees, plants, horns, rays, rivers, serpentine lines, vascular motifs or ornamental offshoots. Spirality and waves may signify movement, water, energy, cyclicity, breathing, growth or transition. Even where the specific cultural meanings of these elements change, their morphological functions may remain comparable.

In this respect, the artefact is not only a bearer of symbols, but also a bearer of structural memory. It records not merely ‘what a culture thought’, but also ‘how it perceived’ order. The ancient craftsperson may not have made the modern distinction between natural form, religious sign and artistic composition. For them, the wave, snake, river, life, death, fertility, sky, earth and movement may have been connected within a single figurative field. Yet it is precisely this unity that makes the artefact important to the philosophy of form. Within it, natural observation, symbolic meaning and compositional structure have not yet been separated. Modern analysis may distinguish these levels, but it should not forget that within the culture itself they often existed together.

It is especially important that the artefact translates process into stable form. Natural processes are mutable: water flows, a plant grows, a flower opens, lightning disappears, a cloud changes its contours, a wave passes, and a body is born and dies. The artefact records this process within material. A zigzag on a vessel may preserve the image of flowing water, lightning, a snake or a mountain line. A spiral upon stone or ceramics may retain the idea of rotation, growth, return, emergence or unfolding. Concentric circles may record the image of a centre, expansion, a celestial cycle or an original wholeness. A vertical figure with branches may preserve a scheme of growth and connection among levels. The artefact makes the moving motionless, the temporal visible and the process a sign.

The artefact may therefore be regarded as a form of arrested morphogenesis. This does not mean that the object itself continues to develop like a living organism. Rather, an image of a process may be arrested and preserved within its composition. The opening flower becomes an ornamental rosette. The wave becomes a recurrent line. The snake becomes a zigzag or spiral. The tree becomes an axial scheme of the world. The seed becomes a circle or point. The river becomes a line of movement. The mountain becomes a serrated contour. Celestial order

becomes a circle, star or radial composition. In every case, natural movement acquires a cultural form.

This understanding makes it possible to reconsider ancient reliefs, seals, vessels, ornaments, cultic objects, architectural details and sacred geometries. They may be not only illustrations of myths, but also schemes expressing the human relationship with the form of the world. An ancient relief may depict a deity, ruler, ritual, animal or plant, while its composition is simultaneously organised through an axis, symmetry, circle, sign of water, star, plant, staff, stream or opening element. An ornament may be decorative, but it may also repeat waves, seeds, shoots, spirals, zigzags, mountains, the Sun, Moon, stars and branches. Sacred geometry may possess a religious meaning while simultaneously constituting a rigorous organisation of the centre, nesting, radiality and repetition.

Within the hypothesis of the Unified Matrix of the Universe, these forms are especially interesting because they may be read as cultural analogues of morphogenetic invariants. They are analogues rather than proofs. If the book identifies the centre, axis, layer, edge, branching, radiality, spirality and stages of opening within natural systems, the same features may be sought within artefacts, but now in symbolically created form. This is the cultural and symbolic level of the Matrix: it does not mean that culture directly confirms a natural law, but that culture may preserve and rework observed structural motifs.

It must be emphasised that the artefact is not empirical proof of natural morphogenesis. A circle depicted upon an ancient object does not prove a universal law of the circle-seed. A central axis upon a relief does not prove the existence of a unified physical axis of the Universe. Waves or zigzags within an ornament do not prove that the ancient craftsperson consciously recorded geological folding or nonlinear dynamics. Such forms may nevertheless be important to another type of analysis. They demonstrate that particular morphological motifs remained stable within human visual thought. This is already significant to the philosophy of form and the comparative morphology of culture.

The cultural artefact should therefore be considered according to a philosophical and hermeneutic standard of evidence. This standard differs from that of the natural sciences. It does not rely upon experiment in the strict sense. It works with image, structure, meaning, interpretation, context, the recurrence of symbols and visual organisation. Its purpose is not to prove a physical law, but to demonstrate how form becomes a bearer of meaning and how human beings record particular schemes of order within culture. If this distinction is maintained, the artefact may be incorporated into the hypothesis without mystification. If it is violated, the risk of arbitrary interpretation arises.

A methodologically sound approach to the artefact should consist of several stages. First, the archaeological and cultural status of the object must be acknowledged: its material, origin, historical environment, function and established interpretations. This level should then be distinguished from morphological reading. The composition may subsequently be analysed: centre, axis, symmetry, rhythm, repetition, layers, edges, waves, zigzags, circles, spirals, branches and rays. These features should then be compared cautiously with the morphogenetic invariants already examined in the natural chapters of the study. Only after this may an interpretation be proposed: the artefact may be regarded as a record of a scheme of growth, opening, movement, flow, internal tension or connection among levels.

The sequence is crucial. If the analysis begins immediately with the desired interpretation, the artefact will be forcibly subordinated to the hypothesis. Every circle will then become a seed,

every line an axis, every zigzag energy, every rosette a flower, and every ornament proof of the Matrix. Such an approach would be methodologically unacceptable. Serious research must instead begin with the form of the object itself. It is necessary to ask: what is actually depicted? How are the elements arranged? Which features recur? Which features are strong and which are disputable? What alternative explanations are possible? To what extent does the cultural context permit this interpretation? Only then is it possible to speak of a morphological model.

The artefact as a model of form is especially important because it demonstrates the cultural capacity for abstraction. A natural form is always particular: a particular flower, leaf, river, mountain or nebula. The artefact frequently separates form from the particular object and transforms it into a scheme. An ornamental wave is no longer a single particular wave. It becomes a sign of the wave in general, movement in general and rhythm in general. A spiral upon a vessel is not one particular shell or vortex; it becomes a scheme of rotation and unfolding. A tree within an archaic image may represent not a single tree, but a model of verticality, levels and growth. In this sense, culture translates natural form into a more general language.

It is precisely this generalisation that brings the artefact closer to the model. A model always identifies what is essential and discards the particular. It does not reproduce an object in its entirety, but records its principle. If an ancient ornament repeatedly employs a zigzag, it does not depict every real wave or every mountain fold. It records rhythm, fracture, alternation of directions and the tension of the line. If a relief is organised around a central staff or trunk, it may not depict a particular plant, but record the axial principle. If a composition is organised through concentric circles, it may not depict a particular celestial body, but preserve the idea of the centre, circumference, nesting and expansion. The artefact may therefore be understood as a visual condensation of a more complex experience of form.

At the same time, the artefact retains material embodiment. It is not pure abstraction. It is made of stone, clay, metal, wood, bone, fabric, paint, pigment, glass, mosaic or another material. Its form depends upon technology, tools, the craftsperson’s hand, the properties of the material, production traditions, scale, function and conditions of use. This distinguishes the artefact from a purely geometric scheme. It is a material model of form. Within it, the morphological motif is embodied in a particular substance. The artefact therefore connects three levels: natural observation, cultural meaning and material production. It is precisely this that makes it an especially complex and valuable object of analysis.

The cultural and symbolic level of the Matrix should not be regarded as secondary or decorative. It demonstrates that the problem of form possesses not only a natural-scientific, but also an anthropological dimension. Human beings are creatures who recognise forms, construct the world through images, transmit order through symbols, create signs and situate themselves within the cosmos by means of visual schemes. If the centre, axis, layer, edge, branching and opening recur within nature, it is unsurprising that the same motifs become stable within culture. They are useful for thought because they connect the visible with meaning. The circle readily becomes an image of wholeness; the axis, an image of connection among levels; the tree, an image of growth; the wave, an image of movement; the spiral, an image of unfolding and return; the flower, an image of opening; and the seed, an image of beginning.

The persistence of these images should not, however, be explained solely through the observation of nature. Culture possesses its own history. Symbols spread through contact, migration, religion, trade, power, artistic canons, craft traditions and ritual practices. The same motif may pass from one culture to another, change its meaning, become incorporated into new

systems, lose its original function and acquire a new one. Morphological analysis should therefore not replace historical and cultural analysis. It can only complement it. If an ornament contains a spiral, it is necessary to consider its cultural history, compositional role and possible morphological significance. Only the combination of these levels makes interpretation responsible.

The artefact as a model of form is especially important to the following chapters, which are devoted to the World Tree, Sumerian reliefs, sacred geometry, the Sri Yantra, the lotus and crop circles. All these materials possess different statuses. The World Tree belongs to mythological and cosmological systems. Sumerian reliefs belong to a particular ancient culture and its iconography. Sacred geometry belongs to religious, philosophical and ritual traditions. The Sri Yantra belongs to a rigorously defined spiritual and geometric system. Crop circles possess their own problems of origin, perception and interpretation. They cannot be combined within a single sequence as equivalent forms of evidence. They may, however, be regarded as different types of cultural record of form, provided that the level of analysis and the limits of the conclusions are clearly specified.

In this sense, Chapter 18 should prepare a method of cultural-morphological reading. The artefact is considered not as an illustration of a ready-made truth, but as an object within which a structural scheme may be sought. This scheme may be strong or weak, evident or disputed, central or secondary. Sometimes an artefact is genuinely organised around an axis, centre, wave or opening. Sometimes such features are imposed by the researcher and must be rejected. Sometimes morphological reading is possible only as an additional hypothesis. The purpose is not to declare every artefact evidence, but to learn to distinguish the degree of its morphological expressiveness.

This approach makes it possible to avoid mystification. The hypothesis of the Unified Matrix of the Universe should not become a claim that every ancient culture secretly knew the same universal scheme and encoded it within all its objects. Such a claim would be historically and methodologically vulnerable. A far more serious position is that different cultures, while observing nature and organising their symbolic worlds, may have preserved similar morphological motifs either independently or through tradition because those motifs genuinely recurred within human experience. Human beings saw circles, axes, trees, waves, branches, spirals, seeds, flowers, stars, mountains and rivers. They transferred them into objects because these forms provided a convenient means of thinking about order.

This is why the artefact should not be reduced to myth. Myth is one means of interpreting the artefact, but it is not the only one. The artefact is also form, composition, material, technology, scheme, the memory of the hand’s movement, a trace of observation and a model of the human relationship with space. If attention is confined to myth, geometry may go unnoticed. If attention is confined to archaeological function, morphological organisation may be overlooked. If attention is confined to artistic style, the recurrent structural principle may remain unseen. The purpose of this chapter is to demonstrate that the artefact may be read as a multilayered object within which the mythological, material, artistic and morphogenetic coexist.

Within such a reading, the concept of the visual scheme acquires particular significance. A visual scheme differs from a realistic image. It may be conventional, generalised, geometrised, symmetrical, rhythmic and repetitive. It does not need to reproduce a natural object precisely. On the contrary, its strength often lies in its ability to isolate structure. The zigzag does not reproduce a river, but demonstrates movement and abrupt change. The circle does not

reproduce a seed, but demonstrates closure and the centre. The spiral does not reproduce a particular shell, but demonstrates rotational unfolding. The tree does not reproduce a single botanical species, but demonstrates verticality and branching. Such a scheme is a cultural means of preserving a morphological principle.

When artefacts are considered in this way, they become important material for the hypothesis, but material of a particular kind. They do not speak directly about the natural Matrix. They speak about how human beings perceived and structured the world. Whereas the natural chapters of the study examined forms as the results of processes of self-organisation, the cultural chapters must examine forms as the results of the symbolic organisation of experience. These are different processes. Nature creates form through physical, chemical, biological, geological and cosmic mechanisms. Culture creates form through perception, memory, tradition, image, technique and meaning. Yet structure emerges in both cases. It is for this reason that dialogue between natural and cultural morphology is possible.

Such a dialogue is most productive when it does not seek to prove too much. An artefact may demonstrate that a particular morphological motif was significant to a culture. It may show that the centre, axis, circle, wave, tree or spiral possessed enduring visual power. It may show that human beings associated form with order, movement, life, the sky, water, fertility, power, death, rebirth or the cosmos. It cannot, however, prove the physical universality of the Matrix by itself. Its evidentiary status is different: interpretative, hermeneutic, structural and semantic. Recognising this status makes the analysis not weaker, but more precise.

Section 18.1 therefore introduces the foundational principle of the entire cultural and symbolic part of the study. The artefact is considered not only as a mythological object, but also as a model of form. This means that it may be examined not only for narrative, function or cultic meaning, but also for a morphological scheme: centre, axis, boundary, layer, wave, zigzag, spiral, branching, radiality, opening, closure, internal and external. Such a scheme does not negate archaeological or historical-cultural analysis, but adds a level concerned with the philosophy of form. It is at this level that the artefact becomes important to the hypothesis of the Unified Matrix of the Universe: it demonstrates that recurrent principles of form exist not only within nature, but also within the human way of perceiving, remembering and symbolically organising the world.

The subsequent analysis of the artefact will develop through several key features. The central axis must be examined first, since many ancient images and objects are organised around a vertical, staff, trunk, ray, central figure or radial centre. Attention must then turn to undulating and zigzag elements, which may record movement, flow, folding, tension, water, a snake, a mountain, lightning or rhythm. After this, it will be possible to consider the artefact as an ‘opened bud’—that is, as a form in which internal order has become an external image. The final step will be a discussion of the limits of interpretation, since the risk of overinterpretation is especially great at the cultural level.

The artefact therefore opens a new horizon for the hypothesis. If natural forms demonstrate how matter becomes organised into structure, cultural forms demonstrate how human beings transform observed order into a sign. There is no simple identity between nature and culture, but there is a relationship of reflection, reworking and symbolic preservation. The artefact is not proof of the Matrix in the natural-scientific sense. It may, however, serve as evidence that for thousands of years human consciousness has recognised, preserved and reproduced the same morphological motifs: the centre, axis, circle, wave, branch, spiral, layer, opening and the

relationship between the concealed and the manifested. This is why the artefact deserves to be considered not only as myth, but also as a model of form.

18.2. The Central Axis of the Artefact

One of the most persistent morphological features of ancient artefacts is the central axis. It may be expressed explicitly—as a vertical line, staff, trunk, spear, column, body of a figure, central seam, symmetrical composition, ray, rod or principal sign. It may also be expressed implicitly—through the balance between the right and left sides, the arrangement of elements around an invisible vertical, the division of the object into upper and lower zones, or the direction of a gaze, gesture, ornament or entire composition. In every case, the axis of the artefact performs more than a decorative function. It organises the object's space, connects its parts, determines the direction in which it is read and transforms individual elements into a coherent form.

The central axis is one of the features that allows the artefact to be regarded not only as a mythological or cultic object, but also as a model of form. If the centre indicates the point at which meaning is concentrated, the axis indicates the direction of organisation. The centre answers the question: where is the principal node of the form? The axis answers another: how is this node connected with other levels, zones and elements? Within an artefact, the axis may connect upper and lower, internal and external, earthly and celestial, base and summit, body and sign, humanity and cosmos, seed and opening, concealed origin and manifested structure. The axis is therefore not merely a geometric line, but a morphological principle of connection.

At the natural levels of the study, the axis has already been considered one of the key invariants. In biological form, it appeared as a stem, the midrib of a leaf, the vertical of a bud, the trunk of a tree, the direction of growth or the principal line of opening. In geological form, it appeared as a valley, ridge, fault line, tectonic direction, channel, elongated fold or axis of tension within relief. In cosmic structures, it appeared as a direction of ejection, rotation or elongation, the symmetry of a shell or the distribution of matter. At the cultural and symbolic level, the axis acquires a new status: it no longer merely arises within matter, but is consciously or traditionally recorded by human beings within a sign, image or object.

It is this that makes the central axis of the artefact especially important to the hypothesis of the Unified Matrix of the Universe. If people in different cultures repeatedly created objects organised around a vertical or radial centre, this may indicate the profound persistence of axial thought. Such persistence does not necessarily prove the existence of a universal natural law. It does, however, demonstrate that human consciousness perceived the order of the world through axial structures. Human beings observed the verticality of the tree, body, mountain, column of smoke, ray of light, rising stem, falling rain, lightning, column and staff, as well as the directions of roads, rivers, the horizon and celestial movement. These observations may have been preserved within artefacts as schemes of connection and organisation.

Within ancient objects, the central axis frequently coincides with the vertical of the human body. The figure of a human being, deity, ruler, priest, hero or anthropomorphic creature normally possesses its own axis: head, torso, legs, position of the arms, centre of the chest and line of sight. Even when the image is stylised, the verticality of the body retains its compositional force. It divides space into right and left sides, establishes the relationship between upper and lower, and allows additional signs to be arranged around the figure. In such cases, the body becomes

not only the representation of a character, but also an axial scheme of the world. Through human verticality, culture expresses ideas of order, position, power, connection among levels and centralised form.

Artefacts in which the central figure holds a staff, sceptre, spear, stem, branch or another vertical object are especially revealing. Such an element reinforces the axial structure of the composition. The staff may be a sign of power, ritual function, mediation, sacred status or directed action. Morphologically, however, it is a line that gathers space around itself. It may connect earth and sky, the hand and an external sign, the body and surrounding elements, or the centre of the figure and the upper region of the image. Within the hypothesis of the Matrix, the staff is important not because it always possesses the same cultural meaning, but because it frequently performs the same structural function: it establishes the axis around which the composition is organised.

The vertical axis may also be expressed through the image of a tree. Within cultural artefacts, the tree often serves as a model of growth, the connection among levels and the transition from a concealed foundation to a branching form. The root indicates a lower, concealed or subterranean level; the trunk, a vertical connection; the branches, opening and multiplicity; the crown, an upper, manifested or celestial level; and fruit and seed, the reproduction of the cycle. Even when a particular artefact is associated with a myth, ritual or cultic image, the tree remains morphologically axial. It demonstrates how a single vertical may generate a multilevel form. The tree is therefore one of the strongest cultural analogues of the morphogenetic axis.

Alongside the vertical axis, artefacts frequently contain a radial axis—or, more precisely, a system of axes radiating from a centre. In this case, the composition is organised not from top to bottom, but from a central point towards the periphery. Such forms include rosettes, solar signs, star-shaped compositions, mandala-like structures, circular seals, ornamental discs, shields, medallions, circular vessels, concentric images, radial ornaments and certain architectural plans. Radial organisation demonstrates a different type of order: not a vertical connection among levels, but the expansion of form outwards from the centre. The centre acts as the source, while the rays, petals, lines or segments become directions of opening.

The radial axis is especially close to the images of the flower, star, Sun, eye, seed, circle and open form. In the natural chapters of the study, radiality was considered one of the features of the transition from centre to periphery. Within the cultural artefact, this principle acquires symbolic permanence. A solar disc may be a religious sign, yet it is simultaneously a model of the centre and radial propagation. A rosette may be a decorative motif, yet it also records the structure of the flower and radial opening. A star-shaped sign may possess astronomical, sacred or political meaning, but morphologically it demonstrates a centre, rays and the multiple directions of form. This is why radial artefacts are important to the comparative morphology of culture.

At times, vertical and radial axes are combined within a single object. A central figure may be placed within a circle, surrounded by rays, positioned upon the axis of symmetry inside an ornamental field or shown holding a sign from which other elements radiate. A tree may be inscribed within a circle. A staff may be crowned with a star, rosette, crescent or disc. An architectural composition may possess both a vertical dominant and a circular structure at its base. In such cases, the artefact becomes especially interesting because it unites two types of morphological organisation: axial and radial. The vertical connects levels, while radiality opens the centre into space. Together, they form a complex model of order.

From the perspective of the hypothesis of the Unified Matrix of the Universe, this combination is especially significant. It may be understood as a cultural record of the transition from a closed centre to an open structure. The centre does not remain an immobile point; it acquires direction. The axis does not remain a simple line; a field forms around it. Radial elements do not exist independently; they proceed from the centre or are organised around it. A composition thereby arises in which centre, axis and periphery are connected. This is one of the most important morphological scenarios of the study: the internal concentration of form passes into manifested space through an axis, layer, ray, branch or opening.

The central axis of an artefact may also be compositional, even when the object contains no explicit line. Many ancient images are constructed symmetrically: the right and left sides are balanced, figures are mirrored, animals face a central object, ornamental motifs are distributed on either side, and the upper zone corresponds to the lower. In such cases, the axis may be invisible, but it governs the entire composition. It is present as a principle of equilibrium. The researcher perceives it not because it has been drawn, but because the object is organised around it. Such an invisible axis is especially important: it demonstrates that form may possess an internal order that is not always expressed by a direct line.

A symmetrical composition frequently indicates a cultural desire to represent order as equilibrium. The two sides of an artefact may signify oppositions: right and left, male and female, earthly and celestial, life and death, day and night, water and fire, human and animal, internal and external. Morphologically, however, these oppositions are held together by the axis. Without the axis, symmetry would disintegrate into arbitrary repetition. The axis makes difference organised. It enables the object not merely to contain elements, but to connect them into a whole. The symmetry of the artefact must therefore be considered together with its axis rather than separately from it.

The artefact does not, however, always strive towards perfect symmetry. In certain cases, the axis is disrupted, displaced, curved, divided or concealed by the dynamics of the composition. This is especially important because axes within natural forms are likewise rarely perfectly regular. The midrib of a leaf may be curved, the trunk of a tree inclined, a valley winding and a cosmic ejection asymmetrical. Within artefacts, a displaced axis may indicate movement, tension, transition, ritual action, conflict, transformation or the living dynamics of form. Morphological analysis must therefore record not only the presence of an axis, but also its condition: whether it is straight or curved, central or displaced, stable or disrupted, single or multiple.

The disruption of an axis may be as significant as its preservation. If the vertical of an object is slightly displaced, the central figure turned, a staff inclined or one side of the composition heavier than the other, this may indicate not a lack of skill, but morphological dynamics. The form ceases to be static and begins to indicate a process. Within the hypothesis of the Matrix, this corresponds to the general principle of transition from symmetry to asymmetry. The perfect axis signifies potential order, but development frequently begins with the disruption of equilibrium. Within an artefact, this disruption may be interpreted culturally through gesture, movement, zigzag, wave, rotation, inclination, rupture or a reversal of the composition.

The central axis is also connected with scale. Within a small artefact—an amulet, seal, pendant, vessel or stone plaque—the axis may organise the object's local form. Within a monumental artefact—a stele, temple relief, architectural complex or megalithic structure—the axis may organise the space of movement, ritual, vision and human bodily presence. In both cases, the axial principle persists, but its scale changes. The small object is held in the hand and read by the

eye. The large object incorporates the viewer's body into its own axis: the individual enters, ascends, turns towards the centre, moves along a line, passes through a threshold or orients themselves according to a vertical. The axis of an artefact may therefore be not only visual, but also spatial and behavioural.

This is especially important to an understanding of architectural and ritual forms. The road to a sanctuary, a central passage, an altar line, a vertical tower, staircase, column, dome, inner courtyard, circular space, oriented stele or entrance axis may function as artefactual axes in an expanded sense. They organise not only an image, but also human movement. In such cases, the artefact ceases to be merely an object and becomes a spatial scheme. It establishes a route, direction, centre, threshold, transition and hierarchy of zones. From the perspective of comparative morphology, this is especially interesting: the axis manifests itself here as a line not only of form, but also of action.

The central axis of an artefact may also be associated with a conception of the cosmos. In many cultures, the vertical connects the subterranean, earthly and celestial; the lower, middle and upper worlds; the foundation, human space and the divine realm; root, trunk and crown; or earth, mountain and sky. Such a cosmological vertical may be expressed through a tree, mountain, pillar, ladder, staff, tower, column, temple, body of a deity or central sign. In this case, the artefact is not merely decorated with an axis. It represents the world as an axial structure. The world is conceived not as chaotic space, but as an organised vertical in which the levels are interconnected.

This is highly significant to the hypothesis of the Unified Matrix of the Universe. Within natural forms, the axis is a means of organising matter. Within cultural forms, it becomes a means of organising meaning. Yet a connection exists between these levels: human beings derive the axial principle from their experience of nature and their own bodies. The body possesses a vertical. The tree possesses a trunk. The mountain rises. The river possesses direction. Light falls or rises. Smoke ascends. Lightning connects sky and earth. Such observations may have become the foundation of the cultural vertical. The axis within an artefact is therefore not an arbitrary abstraction. It is rooted in human bodily, natural and cosmic experience.

It cannot, however, be asserted that all axial artefacts possess the same meaning. In one culture, a vertical staff may signify royal power; in another, ritual mediation; in a third, a weapon; in a fourth, a plant stem; and in a fifth, the cosmic axis. A radial sign may represent the Sun, a star, flower, eye, wheel, symbol of time, emblem of power or decorative motif. Morphological analysis must not erase these distinctions. It must formulate its conclusion more precisely: despite their different cultural meanings, certain compositional structures recur. It is these structures that constitute the subject of the comparative morphology of the artefact.

Visually, the central axis of the artefact may be presented in an illustration as a comparative scheme of several types of axial organisation: a vertical figure or staff, a tree-like structure, a radial sign, and a symmetrical composition arranged around an invisible central line (*Fig. 1*). Such an illustration should not be a reconstruction of a particular historical monument, but an analytical scheme. Its purpose is to demonstrate that an axis may be material, compositional, vegetal, anthropomorphic or radial. It should emphasise not an affiliation with a particular culture, but the general morphological principle according to which the artefact is organised.

Such an illustration must be accompanied by a methodological explanation. If the book employs a generalised scheme of an axial artefact, it should not be perceived as an exact archaeological reconstruction. It is a model of a feature, not an image of a particular monument. It helps to

explain how the axis operates: as a line of connection, a centre of symmetry, a direction of growth, a vertical of power, a path between levels or the foundation of radial opening. When particular artefacts are examined later, each object must be considered separately, with attention to its dating, culture, material and established interpretations. At this stage, however, the axial scheme helps establish a common language for morphological reading.

The central axis also helps to explain why an artefact is frequently perceived as a complete and ordered form. Even a complex ornament becomes legible when it possesses an axis. Even a scene containing numerous figures acquires structure when its elements are arranged relative to a central line. Even a circular composition becomes organised when it possesses a centre and radial directions. The axis transforms multiplicity into a system. It makes the object not an arbitrary collection of details, but a whole. In this respect, the axis performs the same morphological function as it does within natural forms: it maintains the relationships among parts and establishes the directionality of the whole.

It is especially important that the axis within an artefact frequently connects the visible with the invisible. A line, figure, staff, tree, trunk or column may be visible. What remains invisible is the organising principle expressed by that line: the connection among levels, the order of the world, movement from foundation to summit, the transition from internal to external, the relationship between centre and periphery, or the equilibrium of oppositions. The artefact presents a visible form, but through it culture frequently speaks about an invisible order. This is why the axis possesses not only compositional, but also philosophical significance. It is the line upon which form becomes meaning.

Within the hypothesis of the Unified Matrix of the Universe, the central axis of the artefact may be understood as a cultural record of one of the fundamental morphogenetic invariants. This invariant does not belong exclusively to culture. It manifests itself within biology, geology, the cosmos and symbolic thought. Within the artefact, however, it acquires a distinctive form: it becomes a deliberately created sign. The natural axis arises through the process of form generation; the cultural axis is created by human beings as an expression of order. There is no direct identity between them, but there is structural continuity. Human beings identify the axis within the world and return it to the world in the form of an artefact.

This understanding makes it possible to view many ancient objects in a new way. Their axial compositions may be more than consequences of aesthetic symmetry or technical convenience. They may record a deeper need to represent the world as ordered. An artefact with a central axis declares that form possesses direction; chaos can be gathered; upper and lower are connected; the sides are balanced; the centre has not been lost; movement can be organised; and a multiplicity of elements can be subordinated to a single principle. In this sense, the axis is one of the most ancient cultural means of thinking about order.

The researcher must nevertheless remember that the presence of an axis does not automatically confirm the hypothesis. An axial composition may result from the technology of manufacture, the convenience of symmetrical construction, the requirements of representing the body, an artistic canon, the object's function or an arbitrary compositional choice. Every particular case must therefore be analysed separately. Morphological reading must not replace archaeological explanation. It may only add a question: if an axis is present, what structural role does it perform? Does it connect levels? Does it organise symmetry? Does it establish the direction of opening? Is it the principal invariant of the form or merely a technical element of the composition?

This question makes the analysis more rigorous. Not every line is an axis in the morphogenetic sense. Only a line or organisational principle that genuinely connects the parts of a form and establishes its internal structure may be regarded as an axis. If a line is arbitrary, decorative or secondary, its significance should not be exaggerated. If, however, the entire composition is constructed around it; if it connects the principal elements and determines symmetry, direction, levels and the concentration of meaning, then it may be considered a morphological invariant of the artefact. This distinction is essential to the scientific integrity of cultural and symbolic analysis.

Thus, the central axis of the artefact is not a simple compositional detail, but one of the most important means by which culture records form. It may be vertical, radial, concealed, symmetrical, displaced, bodily, vegetal, architectural, ritual or cosmological. It may express power, growth, the connection among worlds, order, movement, centre, equilibrium or opening. Its particular meaning depends upon culture and context. Its morphological function, however, remains recognisable: the axis gathers form, connects levels, organises sides, establishes direction and transforms a multiplicity of elements into a whole.

This is the significance of the axis to the hypothesis of the Unified Matrix of the Universe. At the cultural and symbolic level, it demonstrates that human beings not only observed the order of nature, but reproduced it within objects. An artefact possessing a central axis becomes a visual expression of the structural coherence of the world. It demonstrates that form may be understood as connection: between upper and lower, centre and periphery, concealed and manifested, body and sign, nature and culture. The analysis of the central axis is therefore an essential stage in the study of the artefact as a record of a morphogenetic scheme.

18.3. Undulating and Zigzag Elements

Whereas the central axis of an artefact expresses coherence, verticality, connection among levels and compositional equilibrium, undulating and zigzag elements introduce another principle into the artefact—the principle of movement. They disrupt the static quality of form and transform the object's surface into a field of rhythm, flow, tension, oscillation, bending, rupture or transition. A wave, zigzag, serpentine line, meander, serrated mountain form, broken band, recurrent angle, spiral movement or rhythmic line upon an ancient object is rarely merely an ornament. Even when such elements perform a decorative function within a particular culture, their morphological structure indicates a deeper means of recording process.

An undulating line differs from a straight one because it does not simply connect two points, but demonstrates a change of direction. It contains an alternation of ascent and descent, tension and release, approach and withdrawal, bending and straightening. Such lines occur continuously in nature: in the movement of water, the contours of rivers, coastlines, folds of rock, lines of sand dunes, wood grain, the form of a snake, the swaying of grass, cloud edges, traces of wind, tectonic bends, lava flows, folds of fabric and bodily rhythms. The wave within an artefact may therefore be understood not only as a sign of water, but also as a broader scheme of movement.

Unlike a smooth wave, the zigzag records movement through abrupt changes of direction. It is based not upon a continuous curve, but upon an alternation of sharp turns. The line appears to encounter resistance, alter its course, return, break again and continue moving. Morphologically, the zigzag is closer to lightning, a mountain ridge, fracture, serrated edge, fault, fold, angular

rhythm or fluctuation of tension. If the wave expresses fluidity, the zigzag expresses intermittent energy. If the wave demonstrates gentle movement, the zigzag demonstrates movement through resistance. Both motifs are important to the cultural and symbolic level of the Matrix because both translate process into a stable visual form.

Ancient artefacts frequently employ such lines upon vessels, stone slabs, seals, fabrics, weapons, cultic objects, jewellery, architectural details, murals and reliefs. Waves may run around the edge of an object, form a band, surround a central figure, separate one register from another, or represent water, air, energy, a snake, plant stem or cosmic flow. Zigzags may serve as borders or as signs of mountains, lightning, rivers, snakes, movement, protective boundaries, recurrent rhythms or tension-filled forces. For the purposes of the present study, however, it is not only the specific symbolic meaning of these elements that matters. Their morphological function is also important: they demonstrate that the artefact is capable of recording not only form as a state, but also form as the trace of movement.

The wave and zigzag may therefore be considered visual traces of process. Within natural systems, a process frequently leaves a line. A river leaves a channel. A wave leaves a rhythm along the shore. Folding leaves curves within rock. A fracture leaves a broken line of tension. Lightning leaves a branching zigzag. A snake leaves a winding trace. Wind leaves rows of dunes. A glacier leaves grooves and valleys. Water passing across a surface creates a network of depressions. A cosmic shell leaves a filamentary edge. By observing such lines, human beings may have transferred them into artefacts, transforming mutable processes into stable signs.

In this sense, undulating and zigzag elements form an important bridge between natural morphology and cultural symbolism. They demonstrate that culture does not merely depict objects, but also records dynamics. A flower, tree, animal, human being or celestial sign may be represented as a relatively stable form. The wave and zigzag, by contrast, contain a sense of movement. They do not depict an immobile thing, but reveal a trajectory, rhythm, force, tension or change. Such elements are therefore especially significant to the hypothesis of the Unified Matrix of the Universe, within which form is understood not as an external contour, but as the trace of becoming.

The wave within an artefact may possess several levels of interpretation. At the first and most direct level, it may signify water: a river, sea, current, rain, spring, fertility, purification or boundary between worlds. At the second level, it may signify movement in general: the passage of time, breathing, vital force, cyclicity or alternation. At the third level, it may constitute a morphological scheme of oscillation: ascent — descent, compression — expansion, tension — release. At the fourth level, it may be a compositional element connecting parts of the artefact, directing the gaze, establishing rhythm and organising the surface. These levels do not exclude one another. Within the same object, the wave may simultaneously function as a sign of water, an ornamental rhythm and a model of movement.

The zigzag likewise possesses several possible levels of interpretation. It may signify lightning, a mountain, a serrated edge, serpentine movement, danger, a protective line, boundary, force, rupture, impact or transition. Within an ornament, it frequently creates a tension-filled rhythm: the line does not flow smoothly, but changes direction abruptly. Such a motif may indicate energy that is distributed not gradually, but through sudden shifts. Morphologically, the zigzag is important because it records a departure from straightness. A straight line tends towards the shortest connection between points. A zigzag demonstrates that the path has been complicated

by resistance, fracture and the alternation of sides. It may therefore be considered a cultural scheme of tension-filled movement.

Serpentine and meandering lines play a distinctive role. The snake possesses rich symbolism within ancient cultures: life, death, renewal, the underworld, water, wisdom, danger, fertility, cyclicity, protection and energy. Beyond this symbolism, however, the snake is also a morphological line. Its body forms a smooth undulating movement that combines flexibility, direction and continual transformation of form. When the serpentine motif appears upon an artefact, it may be read not only as the image of an animal, but also as a record of the line of movement itself. The serpentine quality of form is important because it unites the living body with abstract rhythm. Within it, natural movement is already close to becoming ornament.

The meander, in turn, occupies an intermediate position between the wave and zigzag. It may be smooth like a river or geometrised like a rectilinear ornament. Within the natural environment, the meander is associated with the movement of a current that does not proceed in a straight line, but bends, erodes its banks, changes direction, creates loops and leaves traces of former channels. Within culture, the meander becomes a recurrent pattern in which movement has been reduced to a rhythmic scheme. It demonstrates how a natural line may be geometrised, disciplined and transformed into an ornamental and semantic order. The meander is therefore especially interesting as an example of the transition from an observed process to a model embodied in an artefact.

The serration of mountains and the zigzags of ridgelines may likewise have become sources of cultural motifs. The line of mountains upon the horizon is rarely straight. It forms peaks, depressions, angles and rhythms of ascent and descent. Within artefacts, a serrated line may signify mountains, earth, a boundary, fortress, wall, danger, or the upper or lower limit of a composition. Morphologically, however, it also demonstrates the folding and tension of a surface. A mountain line is the trace of tectonic time, uplift, destruction and the resistance of rock. When culture translates it into a zigzag, it records not the geological mechanism, but the visible scheme of a tension-filled form: ascent, fracture, descent and repetition.

It is here that waves and zigzags become connected with the geological level of the Matrix. The chapters concerning stone, relief and submarine forms have already demonstrated that the Earth's surface is frequently organised through folds, layers, edges, stress lines and recurrent boundaries. Within the cultural artefact, these geological motifs may be generalised into ornament. The line of a fold becomes a wave. A ridge becomes a serrated sign. A fault becomes a broken line. Terraces and layers are transformed into recurrent bands. Valleys and rivers become winding lines. This does not mean that every ancient zigzag necessarily depicts a specific geological process. It does, however, allow the zigzag to be considered a possible cultural record of form associated with tension, relief and movement.

Undulating and zigzag elements are also important to the analysis of the edge. Within natural forms, the edge is frequently the most complex zone: the edge of a petal, leaf, relief, coastline, cloud, nebula, fracture or fold of rock. Within artefacts, waves and zigzags are often positioned precisely along the object's edge: around the neck of a vessel, along the border of a fabric, around the frame of a relief, at the boundary of an image, along the edge of a shield, within a wall band or around the periphery of an ornamental field. This placement is not accidental. The object's edge is the point of transition between the internal image and external space. A wave or zigzag along the edge activates this boundary. It demonstrates that the limit of form is not a dead line, but may possess rhythm, tension and meaning.

If the central axis gathers form inwards, an undulating or zigzag edge opens it outwards. It creates a sense of movement along the boundary. It compels the gaze to travel around the perimeter, follow the rhythm, return, repeat and pause at its bends or angles. In this sense, the wave and zigzag are instruments of visual time. They introduce sequence into an immobile object. The viewer does not simply perceive the entire line at once, but appears to traverse it with the eye. An artefact possessing an undulating or zigzag ornament therefore contains not only space, but also a rhythm of perception.

The wave and zigzag are also associated with repetition. A single curve does not yet constitute an ornament. Ornament arises when the curve recurs, acquires rhythm and becomes part of a sequence. Repetition transforms movement into order. In nature, waves recur but are never completely identical. Mountain folds are rhythmic but variable. River meanders follow patterns, yet every bend is individual. Within the artefact, repetition may be more regular because a person has consciously organised the line. Even a rigorous ornament, however, preserves the memory of natural variation: the craftsperson's hand, material, technique, scale and context make every element slightly distinctive. Undulating ornament therefore combines order with living variability.

This relationship between order and variability is important to the hypothesis of the Matrix. If the artefact merely copied nature, it would be an image. If it became completely detached from nature, it would be pure abstraction. The wave and zigzag, however, frequently occupy an intermediate position. They remain recognisable as natural motifs, yet have already been transformed into cultural rhythm. They retain connections with water, the snake, lightning, the mountain, river or fold without being reducible to any of them. They become universal lines of movement. This is why such elements may pass from one culture to another, change their meaning, preserve their form and acquire new significance.

The visual illustration for this section may be constructed as an analytical scheme of the undulating and zigzag elements of an artefact (*Fig. 2*). It would be appropriate to present several types of line: a smooth wave, a serpentine line, a river meander, a mountain zigzag, the broken line of a fault and an ornamental border. Such an illustration should not depict a particular historical monument as an archaeological reconstruction. Its purpose is to demonstrate how different natural processes may be reduced to cultural linear schemes. Such a diagram would enable the reader to see that the wave and zigzag within an artefact are being analysed not as arbitrary decoration, but as morphological records of movement, folding, flow and tension.

Undulating and zigzag elements are especially important because they redirect attention from object to process. The circle, centre, axis, tree, flower or star may be perceived as image-forms. The wave and zigzag, however, are almost always perceived as action-forms. They demonstrate not so much 'what' as 'how': how something flows, bends, breaks, oscillates, repeats and moves, and how tension passes through a surface. They therefore help prevent a static understanding of the artefact. The ancient object becomes not only a bearer of symbols, but also a bearer of rhythms.

These rhythms may be connected with human bodily experience. Human beings themselves move in undulating patterns: breathing possesses rhythm, walking involves repetition, the pulse oscillates, the spine curves, the gesture of the hand leaves a line, and dance is constructed through repetitions and changes of direction. When the craftsperson's hand draws a wave or zigzag, it does not merely copy the external world, but also expresses bodily dynamics. In this sense, the artefact unites natural form, cultural symbol and the movement of the human body.

The line upon the object becomes a trace of the hand, and the hand becomes an intermediary between observed order and created form.

The wave and zigzag may also serve as signs of transition between states. The wave both separates and connects shores, surface and depth, movement and rest. A zigzag may indicate a boundary across which force passes: lightning between sky and earth, a mountain line between earth and sky, a fault between two parts of a surface, or serpentine movement between the visible and concealed. Within artefacts, such elements are frequently positioned in transitional zones: between registers of an image, between the central field and edge, between upper and lower, or between figure and background. They perform a mediating function. They not only decorate the boundary, but also imbue it with meaning.

In this respect, undulating and zigzag elements are connected with the category of tension. Tension within form arises where there is resistance, transition, a difference of directions, a conflict of forces or movement across a boundary. A straight line may appear calm and stable. The wave demonstrates the gentle tension of oscillation. The zigzag demonstrates the sharp tension of a break. The spiral demonstrates the tension of rotation and expansion. The meander demonstrates the tension of a current seeking a path through a resistant environment. Such elements may therefore be considered cultural schemes of tension-filled form. They record not only movement, but also the condition of that movement: interaction with an obstacle, boundary or environment.

It is particularly revealing that waves and zigzags may be associated with both water and stone. Water flows in waves, yet over geological time it cuts into stone. Stone appears rigid, yet its layers may bend into waves under pressure. A river creates a valley; the valley becomes a line within relief; and the line of relief may be transferred into ornament. A single cultural motif may therefore connect several natural levels: the movement of water, the folding of stone, the winding nature of the Earth's surface and the rhythm of the edge. This demonstrates that an artefact does not always record a single particular object. It may record the generalised morphology of a process.

The serpentine motif likewise connects several levels. The snake is a living creature, yet its form is frequently associated with water, rivers, earth, the underworld, lightning, energy, cycles and renewal. Its undulating body allows culture to use it as an image of movement between levels. Morphologically, the snake is a line that has become a body. Within an artefact, it may retain its animal appearance or be transformed into an abstract ornament. In either case, it demonstrates how living form becomes a linear scheme. This is important to the hypothesis of the Matrix: the same morphological principle may pass from biology to symbol, from body to line and from movement to sign.

The zigzag of lightning introduces another aspect: suddenness and discharge. Lightning appears as an abrupt manifestation of energy passing through the atmosphere. Its form branches, breaks, changes direction and creates a bright trace between cloud and earth or within the cloud itself. Within artefacts, broken lines may be associated with lightning, celestial force, fire, danger, divine action or transition between levels. Morphologically, however, lightning is important as an example of a line of discharge. It demonstrates that energy does not always propagate smoothly. At times, it advances in sudden shifts, finding a path through a heterogeneous medium. The zigzag within culture may record precisely this type of movement: abrupt, tension-filled and discontinuous.

The mountain zigzag, river meander, serpentine line, water wave and lightning differ in their nature. Within an artefact, however, they may be reduced to comparable linear schemes. This

does not mean that ancient craftspeople always consciously generalised them into a single morphological category. For modern analysis, however, it is important that culture frequently employs a limited set of lines to depict different processes of movement. The wave, zigzag, spiral, meander, arc, loop, ray and branch form a kind of alphabet of dynamic form. Through this alphabet, the artefact records the movement of the world.

An important idea therefore arises: the artefact may be not only an image, but also a record. It records not in words, but in lines. The undulating line records rhythm. The zigzag records abrupt change. The spiral records rotation. The meander records a path. The ray records direction. The branch records propagation. The circle records return and closure. In this sense, the ancient artefact may be regarded as a visual text of form. It does not communicate a scientific formula, but preserves structural experience. Culture records what nature reveals through processes.

This understanding is especially important to the subsequent analysis of the artefact as an ‘opened bud’. Waves and zigzags are frequently positioned upon the object’s surface as internal rhythms that have already been brought outwards. What occurs through time in nature—flow, folding, oscillation, fracture and tension—becomes an external pattern within the artefact. The internal process is transformed into visible ornament. Undulating and zigzag elements therefore prepare the following section of the chapter: the artefact may be considered a form in which the internal has become external and process has become surface.

Before this, however, the limits of interpretation must once again be emphasised. It is not possible automatically to regard every wave as a sign of water, every zigzag as a depiction of lightning, every broken band as a geological fold, or every serpentine line as a morphogenetic invariant. The specific meaning depends upon the culture, archaeological context, technique, placement of the motif, accompanying elements and established parallels. Morphological analysis does not replace iconographic or archaeological analysis. It merely adds a further question: what structure of movement does this element record? Is it smooth, broken, cyclical, tension-filled, branching, marginal or transitional?

It is precisely this question that makes it possible to avoid arbitrariness. If an undulating motif is situated in a lower register beside fish, vessels or aquatic creatures, its connection with water may be more probable. If a zigzag is associated with celestial signs, it may indicate lightning or celestial force. If a broken line is positioned as a boundary between zones, its function may be divisive. If it recurs around the edge of an object, it may organise an active perimeter. If it is connected with mountain, serpentine or vegetal motifs, its meaning may be different. Morphological analysis must account for all these circumstances rather than displace them.

From the perspective of comparative morphology, the wave and zigzag are important because they demonstrate that the artefact can record processes from different natural levels through a single linear language. Water, mountain, snake, lightning, fold, fracture, river, edge, current, fibre, orbit and spiral movement may all be transformed into lines. The line becomes a universal intermediary between natural process and cultural sign. The analysis of lines within artefacts is therefore an essential part of the cultural and symbolic level of the Matrix. Through the line, human beings not only depict the world, but also organise it into a form accessible to memory.

Undulating and zigzag elements also help demonstrate that the Matrix should not be conceived solely as an order of smooth symmetry. Within nature, order is frequently manifested through irregularity, curvature, rupture, recurrent edges, folds, fractures and oscillations. The cultural artefact preserves this imperfect regularity. It demonstrates that order may be rhythmic, tension-filled, broken and winding. This is especially important to the seriousness of the hypothesis. If the

Matrix were reduced entirely to circles, centres and perfect radial forms, it would be excessively static. Waves and zigzags introduce dynamics, resistance and process.

Thus, undulating and zigzag elements within artefacts may be regarded as cultural records of movement, folding, flow and tension. They translate natural processes into linear schemes. They make the edge active, the surface rhythmic, the boundary meaningful and the ornament processual. They unite water, snake, river, mountain, lightning, fracture, wave and human gesture within a common language of line. They cannot be interpreted arbitrarily or identically in every culture, but neither can they be reduced to mere decoration. Within the hypothesis of the Unified Matrix of the Universe, they demonstrate that cultural form is capable of preserving not only the image of an object, but also the memory of the movement through which form becomes alive in the morphological sense.

18.4. The Artefact as an ‘Opened Bud’

One of the most expressive images for understanding the artefact within the hypothesis of the Unified Matrix of the Universe is that of the ‘opened bud’. This formulation should not be understood literally. An artefact is not a plant; it does not pass through the biological cycle of bud, flower and fruit; it does not open through tissue growth; and it contains no organic programme of development. In a morphological and philosophical sense, however, the artefact may indeed be considered a form in which the internal has become external, a concealed structure has acquired visible expression and an invisible order has been brought to the object’s surface. It is in this sense that the artefact may be interpreted as an ‘opened bud’ of culture.

Within the natural world, the bud is a closed form that already contains the future organisation of the flower. As long as the bud remains closed, its internal structure is concealed. The petals, centre, layers, axis, future radiality and logic of opening remain within it in a state of compressed potentiality. When the bud opens, the internal becomes external: the petals separate, the centre becomes visible, the layers are manifested, the edge begins to interact with the environment, and the form passes from concealed coherence to open organisation. What is especially important in this transition is not only the beauty of the opened flower, but the logic itself: what previously existed as internal order becomes visible structure.

The artefact may be considered according to an analogous morphological scheme. Human consciousness contains an internal image of order: ideas of the centre, axis, wave, tree, celestial circle, movement of water, rhythm of time, connection among levels, fertility, death and rebirth, upper and lower, concealed and manifested. While this image remains within consciousness, it exists as a potential form. When a person creates an object, applies an ornament, carves a sign, constructs a composition, forms a relief, moulds a vessel, produces a seal or depicts a tree, star, wave or central figure, this internal image emerges outwards. It becomes material, visible and transmissible. In this sense, the artefact constitutes the opening of culture’s internal form.

This understanding does not negate the object’s utilitarian, ritual, religious, social or artistic function. A vessel may have been used for storage, ritual libations or funerary rites. A seal may have authenticated power, ownership or an economic transaction. A relief may have glorified a ruler, depicted a deity, recorded a mythological narrative or represented a ritual action. An ornament may have decorated an object, indicated status, provided protection, marked affiliation or followed an established canon. Yet alongside these functions, the artefact

possesses form, and that form may be read as an internal order brought outwards. It is precisely this level of analysis that makes it possible to speak of the artefact as an ‘opened bud’.

Unlike a natural bud, an artefact does not open by itself. It is opened by a human being. The internal form of culture passes through the craftsperson’s hand, material, technique, tradition, symbolic language, and the requirements of ritual or social commission. The result, however, is morphologically comparable: a concealed scheme becomes explicit. If the internal petals of a bud become the external structure of a flower, the internal conceptions of a person become the external composition of an artefact. If the bud opens a biological order, the artefact opens a cultural order. If the flower reveals the morphogenesis of living form, the artefact reveals the morphogenesis of the sign.

This is especially apparent within ornament. The ornamental surface of an object is frequently organised as though an internal rhythm had been unfolded outwards. Waves, zigzags, spirals, dots, circles, rays, branches, rhombi, meanders, bands, recurrent lines and concentric elements cover vessels, stones, fabrics, walls and metal objects. They appear to translate an internal conception of the world’s movement into the visible rhythm of a surface. In such cases, the artefact does not simply possess an external shell; its shell becomes the bearer of manifested meaning. The object’s surface begins to function as an open plane upon which the internal order of culture has become visible.

It may be said that the artefact transforms the surface into a field of manifestation. In an ordinary object, the surface may be merely the boundary of the material. In a cultural artefact, the surface becomes the site of the sign. Lines, figures, axes, waves, circles and images of animals, plants, celestial bodies, people, deities, vessels, streams, trees and stars appear upon it. This surface is no longer neutral. It becomes a space of cultural opening. What existed within consciousness as an image becomes the object’s external morphology. The artefact may therefore be regarded as a form through which culture opens itself by means of matter.

In this connection, it is especially important to distinguish the internal from the external within the artefact. The internal is not necessarily a physical cavity within the object. It may be an idea, scheme, image, mythological structure, ritual order, observation of nature, memory of movement or symbolic connection among levels. The external consists of composition, surface, sign, ornament, relief, material, contour and visible form. When an artefact is created, the internal passes into the external. This transition, however, is neither direct nor mechanical. It always passes through a cultural code. The same natural motif may therefore be opened differently within different cultures: a wave may become a meander, snake, line of water, border or rhythm; a tree may become the World Tree, a vegetal ornament, staff, column, axis or branching scheme; and a circle may become the Sun, seed, eye, disc, mandala, rosette or sign of wholeness.

The artefact as an ‘opened bud’ is especially close to the concept of cultural morphogenesis. Here, morphogenesis is symbolic rather than biological. Form arises not through cell division and tissue growth, but through a process of cultural formation: observation, selection of a motif, generalisation, stylisation, repetition, embodiment in material and transmission through tradition. In both cases, however, there is a transition from the potential to the manifested. Within the natural bud, the potential flower becomes an actual flower. Within culture, a potential scheme of order becomes a manifested artefact. The concept of opening may therefore be used here as a philosophical and morphological category rather than as a narrowly biological metaphor.

It is especially important that the artefact reveals not only an individual image, but also a means of organisation. If an object bears a circle with a central point and radiating lines, for example, this is not merely an image of the Sun or a star. Morphologically, it is a scheme of the centre and radial propagation. If a vessel bears recurrent waves, these are not merely signs of water; they also constitute a scheme of rhythmic movement and a recurrent boundary. If the central figure upon a relief holds a staff, this is not merely a symbol of power or ritual action; it also establishes the axial organisation of the composition. If an ornament unfolds through layers, bands or concentric zones, this is not merely decoration; it is a model of nesting and successive unfolding. In every case, the artefact makes visible a structure that may be read as a morphogenetic scheme.

Here, the connection between the artefact and the A–B–C–D model becomes apparent. Within natural logic, stage A corresponds to the closed seed or potential form; stage B, to the first opening; stage C, to a multilayered structure; and stage D, to complete manifestation and the transition to a new cycle. This scheme operates differently within a cultural artefact, but may be interpreted at the level of symbolic process. Stage A is the internal image that has not yet been embodied in material. Stage B is the first sign, line, axis, circle or initial composition. Stage C is the developed ornament, multilayered scene or complex structure of the object. Stage D is the completed artefact, which becomes a bearer of meaning and may be transmitted to others, repeated within a tradition and reproduced in new objects. The artefact thereby enters the cultural cycle of form.

This is especially important: the artefact not only reveals an internal form, but also becomes a new seed of culture. Once created, an object may be repeated, copied, reinterpreted, incorporated into ritual, passed on to an apprentice, placed within a grave, installed within a temple, used as a model or made part of a canon. What was once an internal image belonging to a craftsperson or community begins, after materialisation, to live as an external image capable of generating new forms. In this sense, the completed artefact corresponds not only to the opened flower, but also to the fruit containing the seeds of future repetition. It is the outcome of one cultural morphogenesis and the beginning of another.

This perspective helps explain why ornaments, symbols and compositional schemes may persist for centuries and millennia. Culture reproduces not every individual object, but its morphological principle. The wave recurs through different techniques and materials. The zigzag passes from ceramics to fabric, from stone to metal, and from an architectural frieze to a vessel. The tree as an axial structure appears within myths, reliefs, embroidery, architecture, heraldry and cultic images. A radial rosette may pass from a floral motif to a solar one, or from a decorative sign to sacred geometry. The artefact becomes an opened bud precisely because its form is capable of opening further—within a series, tradition, canon or memory.

In this respect, cultural form possesses its own fractality. A single motif recurs at different scales and within different materials, changing while preserving a recognisable principle. A small sign upon a vessel may resemble a large architectural ornament. The central axis of a small seal may repeat the axis of a monumental relief. A wave upon a bracelet may possess the same rhythm as an undulating border upon a wall. A rosette upon a piece of jewellery may be morphologically close to an architectural rose window. This is not strict mathematical fractality, but cultural self-similarity. The artefact opens a form, and that form subsequently repeats itself within other artefacts.

The image of the ‘opened bud’ also makes it possible to understand the multilayered character of the artefact more clearly. Within the bud, the layers exist physically: outer sepals, inner petals and central elements. Within an artefact, the layers may be material, compositional, semantic and historical. The material layer is the substance of the object: stone, clay, metal, wood or fabric. The compositional layer is the arrangement of lines, figures, axes, circles, waves and signs. The semantic layer is its mythological, ritual, social or symbolic meaning. The historical layer is the object’s passage through time, tradition, use, destruction, discovery and interpretation. When we examine an artefact, we encounter not a single surface, but an entire system of layers. In this sense, it genuinely resembles an opened bud: its internal levels gradually become accessible to interpretation.

The opening of an artefact occurs not only during its creation, but also during its study. For its ancient user, the object may have possessed one meaning; for the archaeologist, another; for the art historian, a third; and for the philosopher of form, a fourth. Every new act of interpretation appears to open another layer. Yet this creates a methodological risk: the researcher may reveal not what is genuinely present within the object, but what they wish to see. The image of the opened bud must therefore be constrained by scientific caution. An artefact may contain a concealed structure, but not every interpretation of that structure possesses equal validity. Layers confirmed by context must be distinguished from those proposed as hypotheses.

This is why cultural morphology must not only regard the artefact as an open form, but also ask: what exactly has been revealed? Is it a natural motif? A mythological narrative? A social function? A manufacturing technology? A compositional scheme? The memory of the hand’s movement? A universal morphological invariant? The answers may differ. In one case, the artefact may clearly demonstrate an axis, radiality or undulating rhythm. In another, these features may be secondary. In a third, they may result from a later interpretation. Serious analysis must preserve all these possibilities.

The image of the opened bud also helps to clarify the artefact’s relationship with the body. A person creates an object not through the mind alone, but bodily: through the hand, gesture, movement, pressure, chisel, brush, fingers, breath, posture and working rhythm. The internal form emerges outwards through bodily action. The line of an ornament is not merely a sign, but also the trace of the hand’s movement. The symmetry of an object results from bodily and technical control. The wave is the movement of a brush or chisel. The zigzag is the rhythm of a recurrent gesture. A radial composition is produced by the hand moving around a centre. The artefact therefore reveals not only an image of the world, but also a human mode of acting within it. It is a trace of the bodily morphogenesis of culture.

Material also participates in this opening. Clay permits moulding, imprinting, rotation, smoothing and the application of ornament. Stone requires carving, striking, polishing and cutting; it resists the hand and preserves the trace of effort. Metal permits casting, forging, embossing, engraving, bending and lustre. Wood possesses grain, a direction of growth, resistance and the capacity to be carved. Fabric permits the rhythm of thread, pattern, interweaving and repetition. The internal form of culture therefore opens not within emptiness, but through the properties of material. Material constrains and directs form. In this respect, the artefact resembles natural objects: in both cases, form arises through the interaction of internal intention, material, force, constraint and surface.

This understanding makes the artefact especially important to the hypothesis of the Matrix. Within natural forms, the Matrix manifests itself as the order through which matter self-organises.

Within the artefact, it may manifest itself as the order through which cultural material is organised. Human beings do not create form in an entirely arbitrary manner; they work with what is available to their perception, bodies, materials and traditions. The artefact therefore becomes a meeting place between natural invariant and cultural action. It reveals not only what human beings imagined, but also how they learned to perceive order within the world and reproduce it within objects.

The ornamental principle of opening is especially revealing here. Many artefacts possess compositions that unfold from centre to edge, from the lower register to the upper, from the axis to lateral elements, or from a simple sign to complex repetition. This resembles the morphogenetic logic of the transition from A to D: from initial coherence to complete manifestation. A central sign may generate recurrent elements around itself. A vertical axis may branch. An undulating line may acquire additional motifs. A circle may acquire rays, bands, dots or nested circumferences. The object's entire surface may be filled as though an internal order had gradually unfolded outwards.

In this sense, the artefact as an 'opened bud' does not need to resemble a flower. The issue is not external resemblance to a bud or flower, but the logic of manifestation. An ornamented vessel may be an opened bud if its surface displays an internal rhythm brought outwards. A relief may be an opened bud if its composition unfolds a central axis into a system of figures, signs and levels. Sacred geometry may be an opened bud if it demonstrates a transition from a point or centre to a nested, multilayered structure. Even an architectural plan may be read in this way if it unfolds a central idea into a space of movement, thresholds, axes and periphery.

The visual illustration for this section may be constructed as an analytical scheme entitled 'the artefact as an opened bud' (*Fig. 3*). Rather than presenting a particular archaeological monument, it may depict a generalised sequence: a closed internal form; an initial axis or central sign; the unfolding of layers, waves, branches, rays or ornamental bands; and a completed artefact whose surface bears a manifested morphogenetic scheme. Such an illustration should be conventional and methodological. Its purpose is not to prove that a particular object was created as a bud, but to demonstrate the principle itself: the internal order of culture becomes the external form of the artefact.

It is important to emphasise that this image involves no mystification. The 'opened bud' is not an assertion concerning the secret biological life of objects or an attempt to animate ancient things. It is a philosophical and morphological metaphor that helps describe the cultural process of bringing form outwards. An artefact does not live like a plant, but it may preserve a structure of opening. It does not possess biological growth, but it does possess a history of formation. It has no internal organic centre, but may possess a compositional centre. It does not open itself, but reveals the internal image of a culture. In this sense, the metaphor is analytically productive provided that it is not understood literally.

This approach makes it possible to reconsider the surface of an artefact. The surface is not merely the outer side of a thing. It is the zone in which culture becomes visible. Material, hand, sign, image, meaning and form meet upon the object's surface. If the edge or surface of a natural form reveals the interaction between a system and its environment, the surface of an artefact reveals the interaction between culture and matter. Upon it, the internal becomes external. This is why the surfaces of ancient objects are so often saturated with ornament. Culture appears reluctant to leave them empty because it seeks to bring outwards an order that must be preserved, seen and transmitted.

The artefact as an open form is also associated with memory. A natural bud opens, the flower lives for a limited period, then withers and passes into fruit. An artefact may preserve its open form for far longer. It retains the moment of cultural opening within material. Once applied to stone or ceramics, an ornament may outlive its craftsperson, ritual, community and even the culture itself. The artefact is therefore a stabilised opening. It preserves what would have been temporary within a living process. In this sense, culture creates a distinctive type of morphogenesis: it records process within a long-lasting form.

This is why ancient artefacts may be so important to the study of morphological invariants. They preserve not only individual images, but also persistent schemes of perception. If the same axial, radial, undulating or layered structure recurs within objects from different periods and cultures, this may indicate the profound persistence of morphological thought. Yet once again, this does not constitute direct proof of the natural Matrix. It is evidence that human culture has repeatedly opened its internal image of order through comparable forms. This is exceptionally important to the philosophy of the Matrix because the hypothesis concerns not only matter, but also the manner in which human beings recognise the order of matter.

In this sense, the artefact is the point at which three types of memory intersect:

1. Natural memory of form: motifs of the tree, wave, seed, flower, snake, mountain, river and star.
2. Cultural memory of the symbol: myths, rituals, signs, canons, traditions and meanings.
3. Material memory of the object: traces of the hand, technique, wear, damage, preservation and archaeological context.

When we consider an artefact as an opened bud, we perceive not only its composition, but also these layers of memory. Form proves not to be flat, but deep. It simultaneously contains the natural, cultural and material.

This understanding prepares the transition to the following section, which will define the limits of interpretation. The image of the artefact as an opened bud is powerful, but it is precisely for this reason that it requires constraints. It cannot be applied indiscriminately to every object. It cannot be presented as an archaeological fact. It cannot be used as a substitute for dating, iconographic analysis, cultural context or comparative material. It is an additional morphological reading. It helps us perceive how the internal form of culture becomes the external structure of an object. Yet every particular case requires testing: is the artefact genuinely constructed according to a logic of opening? Does it contain a centre, axis, layers, periphery or movement from internal to external? Or has this scheme been imposed by the researcher?

Thus, the artefact as an ‘opened bud’ is one of the principal authorial interpretations of the cultural and symbolic level of the Matrix. It allows the ancient object to be perceived not only as myth, symbol or ornament, but also as a process through which form is manifested. The internal image of order becomes an external composition. A potential scheme becomes a visible sign. The concealed structure of culture emerges upon the surface of the material. The artefact becomes open not because it is biologically alive, but because it reveals the internal content of the human perception of the world. It may be incorporated into the study’s general morphogenetic logic precisely in this sense: as a cultural form in which the concealed has become manifested, the internal external, and process a stable model.

18.5. The Artefact and the Limits of Interpretation

The cultural and symbolic level of the hypothesis of the Unified Matrix of the Universe requires the strictest approach to the limits of interpretation. Whereas the principal risk in analysing biological, geological and cosmic forms lay in drawing different natural mechanisms too closely together, the analysis of artefacts introduces an additional danger: the replacement of historical and cultural meaning with free philosophical interpretation. An ancient object may easily become a field for projection. The researcher may perceive within it a centre, axis, tree, wave, zigzag, seed, flower, opening, cosmic scheme, connection among levels, internal tension and numerous other motifs. Yet not everything perceived by the researcher genuinely belongs to the object itself. Cultural morphology therefore requires particular discipline.

The principal rule of this section may be formulated as follows: the morphological reading of an artefact must not replace its archaeological attribution. An artefact is, first and foremost, a historical object. It was created within a particular culture, at a particular time, from a particular material, using a specific technology and within particular social, ritual, economic, artistic or political practices. It possesses an archaeological context: place of discovery, archaeological layer, associated objects, dating, typological parallels, traces of use and state of preservation. None of this can be negated by a philosophical interpretation of form. On the contrary, every responsible morphological reading must begin by acknowledging these data.

Archaeological attribution answers the following questions: what is the object, where was it found, to which culture does it belong, when was it created, from what material was it made, what was its probable function, which analogues are known, and in what context was it used? Art history and iconography clarify its style, composition, visual language, canon, motifs and connections with other images. Religious studies and cultural anthropology analyse its mythological, ritual, sacred and social meanings. Only then may the question of comparative morphology be posed: which structural features of form are expressed within this artefact, and may they be regarded as a cultural record of a morphogenetic scheme?

If this sequence is violated, the risk of arbitrariness arises. A researcher may take any ancient object and immediately declare it a model of the Matrix merely because it contains a circle, line, wave, tree, figure or recurrent ornament. Such an approach would be scientifically untenable. A circle may represent the Sun, a shield, eye, vessel, wheel, seal, sign of power, decorative element or technical form. A vertical line may be a staff, spear, trunk, body, seam, architectural detail or simply an axis of symmetry. A zigzag may signify water, a mountain, lightning, snake, boundary or decorative border, or possess no meaning that can be reconstructed with confidence. Morphological interpretation is permissible only when it does not destroy this multiplicity of possible explanations.

Several levels of assertion must therefore be distinguished within cultural and symbolic analysis.

The first level is descriptive. It records what is genuinely visible: a line, circle, axis, figure, repetition, symmetry, layer, wave, zigzag, central sign or radial distribution. This level should remain as neutral as possible.

The second level is archaeological, historical and cultural. Here, the object is considered within its context: culture, period, function, material, technique, analogues and established interpretations.

The third level is iconographic and symbolic. Here, the possible meaning of the depicted elements is analysed within the framework of a particular tradition.

The fourth level is morphological. Here, the question concerns the structural role of form: does a line function as an axis? Does a wave constitute a scheme of movement? Does a circle organise a centre? Does the composition express opening or layering?

The fifth level is philosophical and hypothetical. At this level, the artefact may be incorporated into the broader hypothesis of the Matrix as an example of the cultural recording of a morphogenetic invariant.

These levels must be connected, but not conflated.

It is especially important to distinguish the observed from the interpreted. The observed is what can be described without imposing meaning: for example, 'the object contains a vertical line', 'the composition is symmetrical', 'a zigzag ornament runs along the edge', 'the centre is marked by a circle', 'the elements are arranged radially', or 'the surface is divided into registers'. Interpretative statements include: 'the vertical line expresses the axis of the world', 'the zigzag records the movement of energy', 'the circle represents a seed', 'the radial composition is a model of opening', or 'the artefact represents a morphogenetic scheme'. The second type of statement is possible, but it requires justification, context and cautious formulation. It must not be presented as an obvious fact.

The most appropriate expressions at this level are: 'may be considered', 'permits a morphological reading', 'may be interpreted as', 'allows us to identify', 'structurally resembles', 'may be compared within the framework of the present hypothesis', or 'serves as a possible record'. Less appropriate are categorical formulations such as 'proves', 'unambiguously means', 'undoubtedly confirms', 'constitutes direct evidence' or 'demonstrates that ancient peoples knew'. Such linguistic caution is especially important within the cultural and symbolic part of the study. It protects the hypothesis from becoming an arbitrary system of decipherment.

It must be stated directly: ancient artefacts do not prove the existence of the Unified Matrix of the Universe in the natural-scientific sense. They cannot serve as experimental confirmation of a universal morphogenetic law. They do not demonstrate that ancient cultures possessed modern theories of self-organisation, fractality, morphogenesis or nonlinear dynamics. Nor do they permit an automatic conclusion that every ancient symbol was consciously created as a model of the universal order of form. Such a conclusion would be illegitimate. Artefacts may nevertheless be significant in another respect: they demonstrate which forms human consciousness selected, repeated, preserved, stylised and imbued with meaning.

This is precisely their value to the hypothesis. If motifs of the centre, axis, circle, tree, wave, spiral, zigzag, radial structure, layered composition, opening flower, seed or star recur persistently within different cultures, this does not prove the existence of a unified physical Matrix. It does, however, indicate the persistence of particular morphological motifs within human visual thought. Such persistence deserves analysis. It may be connected with the observation of nature, human bodily experience, the technology of manufacturing objects, religious traditions, social codes, astronomical cycles, the geometric simplicity of certain forms or deep structures of perception. The comparative morphology of culture must account for all these possible explanations.

An important limit of interpretation is the inadmissibility of retrospectively attributing modern concepts to ancient cultures. It cannot be claimed that the creators of an archaic ornament 'understood fractal geometry' simply because their pattern contains recurrent elements. Nor can it be said that a craftsperson depicting a tree was 'constructing a model of the morphogenetic

axis' in the modern scientific sense. Circles, spirals and radial compositions should not automatically be treated as schemes of self-organisation. It is more accurate to say that a modern researcher may consider these forms morphologically significant because they display features comparable with the invariants identified in other sections of the study. These are fundamentally different statements.

This distinction is especially important to the scientific reputation of the hypothesis. Interdisciplinary work is always vulnerable where one language begins to appropriate another. If the philosophy of form speaks on behalf of archaeology without sufficient grounds, it becomes weak. If a morphological hypothesis declares itself the only correct explanation of an ancient symbol, it violates disciplinary boundaries. If a cultural artefact is employed as direct proof of a natural law, a methodological error arises. The hypothesis of the Unified Matrix of the Universe must therefore proceed differently: it proposes an additional level of reading that supplements rather than replaces existing scientific approaches.

The morphological reading of an artefact may be productive precisely as an additional level. It asks its questions not instead of archaeology, but after archaeology; not instead of iconography, but alongside it; not instead of the analysis of religion, but in dialogue with it. If an object is attributed as cultic, for example, this does not prevent analysis of its axial composition. If an ornament is explained as a sign of water, this does not prevent recognition of its undulating scheme of movement. If a tree possesses a mythological meaning, this does not exclude its morphological interpretation as a model of verticality and branching. If a star is a sacred sign, this does not preclude analysis of its radial structure. Different levels may coexist, provided that they are not conflated.

At the same time, a morphological reading is not always necessary. Not every artefact should be incorporated into the hypothesis of the Matrix. Some objects are historically important but do not demonstrate pronounced morphogenetic features. Certain ornaments may be too damaged to permit confident analysis. Some forms may result from technology rather than symbolic intention. Certain compositions may possess a clear iconographic meaning in which morphological interpretation would be secondary or superfluous. Such cases must be acknowledged. The hypothesis becomes more serious when it can say not only 'this example is relevant', but also 'the evidence here is insufficient' or 'this object should not be used as a morphological example'.

Degrees of confidence must therefore be introduced into the analysis of artefacts. In some cases, a morphological feature is strongly expressed: the composition may genuinely be constructed around an explicit central axis, radial centre or recurrent wave-like border. In other cases, the feature is moderately expressed: an axis is present, but may result from general symmetry; a wave is present, but its meaning is uncertain; a circle appears, but it is unclear whether it functions as the centre of the composition. In a third group, the feature is disputed: the researcher perceives a possible scheme, but the context is weak, the image is damaged or parallels are absent. In a fourth group, the feature is absent. Such gradation makes it possible to avoid artificial confirmation of the hypothesis.

Particular attention must be paid to the problem of resemblance. Within cultural material, resemblance may have different causes. It may result from the independent observation of similar natural forms. It may be a consequence of cultural borrowing. It may arise from the technical limitations of a material or tool. It may be connected with universal features of human perception, symmetry, memory and the motor activity of the hand. It may result from the

transmission of an ornamental canon. It may also be accidental. The recurrence of a circle, axis or zigzag within different cultures should not therefore be explained immediately through a universal Matrix. Alternative causes must be considered before a possible morphological commonality is proposed.

The zigzag offers an especially revealing example. A zigzag line may arise because it is easy to incise with a cutting tool, because it fills a border effectively, because it signifies water, lightning, a mountain, snake, fire, boundary, movement or a protective sign, because it was inherited from an earlier tradition, because it possesses an aesthetically rhythmic quality, or because it corresponds to the techniques of plaiting or weaving. Morphologically, the zigzag may be regarded as a scheme of tension-filled movement, but this does not negate the other reasons for its appearance. The more possible explanations are considered, the more responsible the interpretation becomes.

The same applies to the central axis. An axis may express the vertical of the world, but it may also result simply from the symmetrical representation of a body. It may be a symbol of power, but it may also be a technical line within the composition. It may organise cosmological meaning, but it may result from a canon of frontal representation. The researcher must therefore ask whether the axis is the principal semantic and structural element or merely a formal convenience. Is it connected with other elements? Does this principle recur within analogous objects from the same culture? Is there evidence of its particular significance? Only then is it possible to discuss the central axis as a morphogenetic invariant of the artefact.

The circle and radial composition likewise require caution. The circle is one of the simplest and most persistent forms within human culture. It may be associated with the Sun, Moon, eye, wheel, vessel, body, grain, seal, shield, celestial cycle, boundary, terrestrial space, ritual circle or pure geometry. It should not therefore be declared automatically to be a ‘seed’ or the ‘Matrix’. Within the framework of the present hypothesis, it may be considered a model of closed wholeness, the centre and potential form, but only if the composition genuinely supports such a reading. If the circle is the technical form of a seal or vessel, its morphological significance may be limited.

Overinterpretation is especially dangerous in relation to damaged or fragmentary artefacts. The less of an object survives, the greater the space for imagination. A fragment of a line may be mistaken for a zigzag, part of a circle for the Sun or a seed, the remnant of a trunk for a tree, and an accidental fracture for a sign. Work with damaged objects must therefore be even more cautious. Original elements must be distinguished from damage, traces of manufacture from later deformations, accidental fractures from intentional lines, and reconstruction from fact. Morphological analysis is possible only where the form can be read with sufficient reliability.

The limits of interpretation are also connected with modern visual perception. We view ancient objects from another period, with different knowledge, images, scientific concepts and aesthetic habits. We are already familiar with photographs of galaxies, microscopic images of cells, fractal models, satellite images of relief and digital data visualisations. Ancient people saw the world differently. There is therefore a risk of perceiving within an artefact something that became available only to modern culture. A contemporary researcher may compare an ornament with a nebula or galaxy, for example, but this does not mean that the ancient craftsperson saw such a cosmic structure. The comparison may be morphologically interesting, but it must not become a claim that ancient people possessed knowledge of modern astrophysics.

This does not mean that contemporary comparisons are prohibited. On the contrary, they may be useful to the philosophy of form. A modern researcher is entitled to say that a particular artefact contains a radial, axial or layered scheme morphologically comparable with other natural forms known today. The researcher is not entitled, however, to assert without evidence that the ancient culture consciously intended those particular natural or cosmic analogues. The distinction between modern analytical comparability and ancient authorial intention must be maintained consistently.

Three questions must therefore be distinguished. The first is: what is depicted upon the artefact? This is a question of description and attribution. The second is: what did it mean to the culture that created the object? This is a question of historical and cultural interpretation. The third is: what morphological structure can a modern researcher identify within the artefact? This is a question of comparative morphology. The answers may coincide, but they are not required to do so. An object may depict water; for the culture, water may have signified fertility and purification; morphologically, the undulating line may be read as a scheme of movement and recurrent boundaries. All three propositions may be valid, but each belongs to a different level.

Serious research must also acknowledge that artefacts are created not by an isolated abstract consciousness, but within a tradition. Motifs are transmitted, repeated, stylised, simplified and canonised. At times, the craftsperson may no longer know the original meaning of an ornament but continue to reproduce it. A form may become a sign of status, affiliation or a school of craftsmanship. A religious symbol may become a decorative motif. A decorative motif may acquire a new sacred meaning. The recurrence of a form does not therefore always imply the recurrence of its original content. A morphological invariant may persist even when symbolic meaning changes. This also means, however, that the researcher must exercise caution when drawing conclusions about meaning.

Material and manufacturing technique also constrain interpretation. A zigzag, for example, may be convenient for carving, weaving, plaiting or application to ceramics. A geometric ornament may arise because the material does not readily permit complex curvilinear forms. Symmetry may be connected with the technology of producing a vessel upon a wheel, the form of a seal, an architectural structure or simple compositional convenience. Radiality may result from the circular form of the object. In such cases, the morphological feature is present, but its origin may be technical rather than symbolic. This does not make it insignificant, but it requires a different interpretation.

This is especially important within the hypothesis of the Unified Matrix of the Universe. If the Matrix is understood as a structural logic of form, it may manifest itself not only through a conscious symbol, but also through the constraints imposed by material and technique. Yet not every technical solution can automatically be regarded as the expression of a universal invariant. It is necessary to distinguish whether a form arose from symbolic choice, technological necessity, aesthetic tradition, functional requirements or a combination of these factors. In many cases, these causes are intertwined. The circular form of a vessel, for example, may be functional and technological while simultaneously being symbolically useful. An ornamental band may be decorative, structurally connected with the vessel's form and morphologically significant as a layer. Such interweaving requires careful analysis.

The limits of interpretation also apply to the authorial concept of the 'artefact as an opened bud'. This metaphor is productive, but it should not become a universal key to every object. Certain artefacts may genuinely be read as the opening of an internal cultural form upon a surface:

ornamented vessels, reliefs, radial compositions, sacred geometries, multilevel images and axial structures. Other objects, however, may lack such logic. They may be primarily utilitarian, fragmentary, technical or compositionally simple. The image of the opened bud should therefore be applied only where there are signs that an internal order has been brought outwards: a centre, axis, layers, radiality, the surface as a field of signs, the unfolding of a composition and a transition from a concealed scheme to visible ornament.

It must also be remembered that the 'internal' within an artefact is a reconstruction. We have no direct access to the consciousness of the ancient craftsperson. We may analyse the object, context, parallels, symbols, traditions and forms, but its internal conception always remains partially inaccessible. Any assertion concerning an internal cultural form must therefore be cautious. We may say that the artefact 'suggests' that a particular scheme has been brought outwards, that its composition 'may be read' as an opening, or that its surface 'serves' as a site for the visualisation of order. Without further evidence, however, we should not assert that this was the creator's conscious intention.

Excessive scepticism, on the other hand, may also be unproductive. If all morphological interpretation is rejected merely because the intention of the ancient craftsperson cannot be reconstructed completely, cultural form will be reduced to descriptions of material and function. Yet artefacts genuinely contain compositions, rhythms, symbols, axes, waves, circles and repetitions. These elements require analysis. The task is therefore not to reject interpretation, but to discipline it. Interpretation should be offered together with an indication of its degree of confidence. A morphological reading should be proposed without being declared the only possible one. Form should be perceived without being transformed into an arbitrary code.

In this sense, the cultural and symbolic level of the Matrix is a domain not of proof, but of hermeneutic probability. Conclusions here must take the form of cautious hypotheses. An artefact may be interpreted as a record of a morphogenetic scheme if its composition is genuinely organised in a corresponding manner. It may be incorporated into a comparative sequence if comparable features recur within several objects or traditions. It may support the hypothesis at the level of cultural morphology if it demonstrates the persistence of particular images of form. It cannot, however, resolve the question of the nature of the Matrix by itself. Its contribution is different: it demonstrates how human beings culturally recognised, generalised and preserved forms of order.

A system of criteria is therefore necessary for subsequent research. An artefact may be incorporated into morphogenetic analysis if several conditions are fulfilled:

1. The form of the object or image is sufficiently well preserved.
2. Its compositional features can be described without excessive reconstruction.
3. Its archaeological or cultural context is at least partially known.
4. The morphological reading does not contradict the object's evident attribution.
5. The identified features are structurally significant rather than accidental.
6. Comparison with other examples is possible.
7. The researcher explicitly indicates where fact ends and interpretation begins.

Such a system of criteria makes the analysis more responsible.

It should also be emphasised that cultural interpretation must remain open to revision. New archaeological data, new dating, new readings of inscriptions, new comparisons and new technological investigations may alter the understanding of an object. What appears today to be

a ritual sign may tomorrow be explained as a functional element. What appears to be ornament may prove to be a written sign. What is perceived as a symbol may possess a technical origin. Morphological interpretation should therefore not become a final dogma. It must remain a working hypothesis connected with the current state of knowledge.

For the scientific seriousness of the study, this must be stated directly. The hypothesis of the Unified Matrix of the Universe does not claim that all ancient artefacts are encoded schemes of universal morphogenesis. It does not claim that every wave, axis or rosette automatically confirms the Matrix. Nor does it claim that cultural symbolism is explained entirely by natural invariants. A more accurate position is as follows: certain artefacts may additionally be read as visual records of morphological schemes because their compositions display features comparable with invariants identified within natural forms. Such a reading does not replace historical explanation, but may expand the understanding of form.

This expansion is highly significant. It allows form to be perceived not only as a natural, but also as a cultural phenomenon. In nature, form arises through the self-organisation of matter. In culture, form arises through the organisation of meaning, material, gesture, memory and tradition. The artefact stands between these worlds. It is made by human beings, yet is frequently constructed from motifs that humans observe within nature. It is material, yet saturated with meaning. It is historical, yet may preserve universal geometric and morphological schemes. Its analysis therefore requires a dual perspective: historical and morphological.

It is precisely this dual perspective that must form the foundation of the subsequent chapters. When the book turns to the World Tree, Sumerian reliefs, sacred geometry, the Sri Yantra, the lotus and crop circles, each body of material must be considered with attention to its own limits. The World Tree cannot be reduced to a morphogenetic axis because it possesses a rich mythological and religious history. A Sumerian relief cannot be read solely as a scheme of grain or opening because it belongs to a particular civilisation and iconographic context. The Sri Yantra cannot be considered solely as a geometric model of the Matrix because it possesses its own spiritual and ritual tradition. Crop circles cannot be incorporated into the same sequence without discussion of their origin, status and contemporary cultural context. In every case, morphological reading must remain additional and limited.

At the same time, it is precisely this additional character that makes the approach valuable. The archaeologist may establish the dating and function of an object. The art historian may describe its style and composition. The scholar of religion may explain its symbolic context. The philosopher of form may ask: what scheme of organisation is manifested here? Such a question does not negate the other answers. It adds a new layer to them. Sometimes this layer may be secondary; at other times, highly significant. It may sometimes reveal connections among objects that are historically different but morphologically employ comparable principles: the centre, axis, branching, undulating line, radiality, layering or opening. This is the potential productivity of cultural-morphological analysis.

The limits of interpretation therefore strengthen rather than weaken the hypothesis. At first sight, caution may appear to make the conclusions less striking. For serious scientific research, however, the opposite is true. A hypothesis becomes more persuasive when it states clearly what it does not claim. It does not assert the literal unity of all symbols. It does not assert the complete identity of natural and cultural form. It does not claim that ancient artefacts are direct proof of the Matrix. It advances a more precise proposition: cultural forms may contain morphological schemes comparable with natural invariants, and this comparison deserves separate analysis.

It is precisely this position that makes it possible to avoid mystification. Mystification arises when a sign is declared a secret code without sufficient grounds, when symbols from different cultures are forcibly reduced to a single scheme, when archaeological context is ignored, when every correspondence is treated as evidence and when the distinction among image, model and fact disappears. A different path must be followed in this book: disciplined interpretation. It acknowledges the power of the image while requiring the analysis of features. It recognises the recurrence of forms while examining their context. It permits philosophical reading without presenting it as archaeological truth. It constructs a bridge between nature and culture without conflating them.

The artefact and the limits of its interpretation thus become an important methodological conclusion. An artefact may be considered a record of a morphogenetic scheme if a centre, axis, wave, zigzag, layer, edge, radiality, opening or another structural form is genuinely expressed within it. It may be read as a model of form if its composition demonstrates not only a decorative motif, but also a means of organising space. It may be interpreted as an 'opened bud' if an internal cultural scheme has genuinely been brought to the object's surface. Yet all these readings must remain supplementary, testable, cautious and open to revision.

The cultural and symbolic level of the Matrix therefore possesses a distinctive status. It does not constitute natural-scientific proof of the hypothesis, but it is an important field for its philosophical and morphological development. It demonstrates that recurrent forms exist not only within nature, but also within human culture—in objects, signs, ornaments, reliefs, images and architectural schemes. Yet it is precisely here that the boundary between observation and interpretation, archaeology and the philosophy of form, cultural context and universal invariant must be observed especially carefully. Only when this boundary is maintained can the artefact be incorporated seriously into the hypothesis of the Unified Matrix of the Universe, without simplification or arbitrary symbolic decipherment.

This establishes the method for the cultural analysis of the Matrix. The artefact is considered not only as myth, not only as a ritual object and not only as a work of ancient art, but also as a possible model of form. Its central axis records cultural order. Its waves and zigzags record movement, flow, folding and tension. Its surface may be understood as the opening of an internal cultural image. Yet all these conclusions apply only within the limits of cautious interpretation. Cultural reading does not replace archaeological attribution. It constitutes an additional morphological level that helps reveal how human beings transformed the observed order of the world into the stable form of an object.

It is with this qualification that the study may proceed to the following chapter and the image of the World Tree. There, the cultural and symbolic level of the Matrix will receive one of its most powerful expressions: the tree as axis, root, trunk, branch, crown, fruit, seed and connection among levels. Yet the principal rule must already be preserved: even the most expressive symbol should be analysed not as direct proof, but as a multilayered form within which historical context, mythological meaning and morphological structure must be considered together without being conflated.

Fig. 1. Central Axis of the Artefact: Vertical, Radial, and Compositional Organisation of Form as a Cultural Fixation of Order

Fig. 2. Undulating and Zigzag Elements of the Artefact: Line as a Record of Movement, Flow, Folding, and Tension

Fig. 3. Artefact as an “Unfolded Bud”: Transition of an Internal Cultural Form into the External Composition of Sign, Ornament, and Object

Chapter Nineteen

The World Tree as a Universal Model of Growth

19.1. The World Tree in Different Cultures

The image of the World Tree is one of the most persistent cultural models through which human beings have interpreted the organisation of the world, growth, the connection among levels, the origin of life and the order of the cosmos. It occurs in different traditions, territories and historical forms: as a sacred tree, cosmic axis, Tree of Life, Tree of Knowledge, genealogical tree, shamanic tree, tree at the centre of the world, or tree connecting the subterranean, earthly and celestial levels. These images do not coincide completely and should not be reduced artificially to a single scheme. Their recurrence nevertheless demonstrates that the tree became one of the most powerful cultural forms for expressing vertical morphogenesis: root, trunk, branching, crown, fruit, seed and the connection among levels.

The World Tree is important to the hypothesis of the Unified Matrix of the Universe primarily because it unites natural form with symbolic structure. The tree genuinely exists as a biological organism. It possesses roots, a trunk, branches, leaves, flowers, fruits, seeds, growth rings, vascular flows, internal layers, bark, a crown and cycles of growth. Within culture, however, the tree ceases to be merely a plant. It becomes a model of the world. Its roots may signify the subterranean, concealed, ancestral, potential or deep foundation. The trunk may signify an axis, path, stability, verticality, connection or central channel. The branches may signify multiplicity, expansion, levels, generations, peoples, stars, celestial regions or forms of life. Fruit and seed may signify reproduction, the return of the cycle and the beginning of a new form. This is why the tree so readily becomes a symbol of the cosmos.

A methodological boundary must, however, be established immediately. The World Tree in different cultures cannot be treated as direct proof of the existence of the Unified Matrix. It is not a natural-scientific fact in the same sense as a leaf, seed, relief or nebula. It is a cultural image, and a cultural image is always connected with myth, ritual, language, historical memory, social structure, religious practice and artistic tradition. The World Tree must therefore be analysed not as a universal ‘secret formula’ known identically to all ancient peoples, but as a recurrent symbolic model through which human consciousness recorded the observable morphology of growth and the connection among levels.

In this sense, the World Tree continues the logic of the preceding chapter concerning the artefact. That chapter demonstrated that cultural form must not replace archaeological attribution or the context supplied by religious studies. The same rule applies here. When we speak of Yggdrasil in the Germanic and Norse tradition, the *aśvattha* in Indian thought, the sacred tree in Mesopotamian art, the ceiba as the World Tree in Maya tradition, the tree of ascent in the shamanic cultures of Siberia, or the Tree of Life and Tree of Knowledge in the biblical tradition, we are dealing in every case with different cultural systems. They cannot be combined mechanically.

A morphological question may nevertheless be posed: why did the tree become such a useful model of the world?

The answer begins with the nature of the tree itself. Unlike the stone, which preserves form through bodily stability, or the flower, which expresses opening during a brief phase, the tree demonstrates prolonged growth. It unites verticality and branching. It descends and rises. It possesses a concealed part—the root system—and a manifested part—the trunk and crown. It grows along an axis while simultaneously spreading to the sides. It repeats the same principle at different scales: the trunk divides into large branches, large branches into smaller ones, smaller branches into slender shoots, and shoots into leaves, while the veins of the leaf again form a branching network. It lives through cycles: bud, leaf, flowering, fruit, seed, dormancy and renewed growth. The tree is therefore an almost complete natural model of morphogenesis.

Culture perceives these features not abstractly, but through experience. Human beings perceive the tree as a vertical living body. They see it emerge from a small seed, grow upwards, take root below and produce branches, leaves, flowers and fruits. They see birds living in its crown, animals sheltering among its roots, its shade providing protection, its fruit providing food, its wood serving as material, and fire emerging from wood. They see that a dead tree preserves its form as a trunk, while a new tree emerges once again from a seed. The tree therefore becomes not only a natural object, but also an image of the connections of life. It unites food, shelter, time, lineage, death, rebirth, sky, earth and the subterranean realm. This richness of experience helps explain why the image of the World Tree appears within such diverse cultural contexts.

One of the best-known examples is Yggdrasil in the Germanic and Norse tradition. Within the mythological system of the northern peoples, this gigantic tree connects different worlds and serves as a cosmic structure in which the vertical, roots, trunk and branches form a model of the Universe. Yggdrasil is not merely a tree in the botanical sense. It is an axis sustaining cosmic order and the spaces of gods, human beings, other creatures, springs, roots and higher regions. For the purposes of the present study, what matters most is not a literal reconstruction of the mythology, but the morphological principle: the tree is conceived as a structure connecting levels. The roots indicate depth, the trunk a central vertical and the branches the expansion of the world.

Within the Indian tradition, the image of the *aśvattha*—the sacred tree that acquires cosmological significance in several philosophical and religious contexts—is especially important. In Indian thought, the tree may be associated with life, sacrificial order, the world and an inverted cosmic structure in which the root lies within the higher principle while the branches extend downwards. This inversion is particularly interesting for morphological analysis. It demonstrates that the cultural model of the tree does not always follow the earthly tree literally. At times, the tree is inverted because the culture seeks to express not a botanical observation, but a metaphysical relationship: the source lies above and its manifestations below. Yet the same scheme persists even here: root, trunk, branches, expansion, levels and the connection between a concealed foundation and the visible world.

Iranian, Middle Eastern and Western Asian traditions contain images of the sacred tree, the Tree of Life, the tree of immortality and the central vegetal motif associated with fertility, royal power, cosmic order, divine blessing or the renewal of life. In the ancient art of Western Asia, the tree frequently appears as a symmetrical central motif surrounded by figures, animals, winged beings or ritual participants. The composition is particularly important to morphological analysis: the tree becomes the central axis of the image. It organises the right and left sides, establishes a vertical, gathers symmetrical elements around itself and transforms the scene into an ordered

space. Even where the particular iconography requires cautious attribution, the tree's structural role as axis and centre is evident within many such compositions.

Within Mesopotamian and Assyro-Babylonian material, researchers frequently interpret the sacred tree in connection with royal, religious and cosmological symbolism. Its forms may be highly stylised: the tree is transformed into an ornamental axis with symmetrical branches, rosettes, palmettes, fruits or geometrised elements. Here, the tree almost ceases to be a naturalistic plant and becomes a scheme. This is especially important to the hypothesis of the Matrix. The more extensively the tree is stylised, the more clearly it functions as a model of form: a central vertical, lateral levels, recurrent elements, symmetry, fruit-bearing or floral nodes, and a connection between the base and upper part. Culture appears to extract the tree's morphological algorithm from the natural tree.

Within the biblical and wider Abrahamic traditions, the images of the Tree of Life and the Tree of Knowledge play an important role in interpreting beginnings, prohibition, choice, life, death, immortality, wisdom and the human relationship with divine order. Here, the tree is not only a natural form, but also a semantic node within human history. It is connected with the garden, the beginning of the human condition, fruit, prohibition, knowledge, life and loss. Morphologically, it is important that the tree once again occupies the centre of a space of meaning. It is not a background element, but a structural object through which culture considers a transition: from innocence to knowledge, from life to mortality, and from a potential state to historical unfolding. In this case, the tree is associated not only with growth, but also with choice, fruit and consequences.

In Slavic, Baltic and other Indo-European traditions, the image of a world or sacred tree may likewise be associated with a vertical model of the world, ancestors, lineage, birds, celestial regions, the subterranean foundation, earthly life, fertility and the cycle of time. The tree frequently becomes a genealogical image: it connects generations and demonstrates the origin and branching of a family, people or memory. This subsequently gives rise to the concept of the family tree. Within it, the mythological vertical becomes a historical and social model: the roots are the ancestors, the trunk the genealogical line, and the branches the descendants and collateral lines. This demonstrates how readily the morphology of the tree may be transferred from cosmology to social memory. The tree becomes a model not only of the world, but also of lineage.

Within the shamanic traditions of Siberia and Central Asia, the tree is frequently associated with ascent, journeys between worlds, the ritual vertical, a ladder or pillar, and a sacrificial or sacred tree through which the shaman symbolically passes through the levels of the cosmos. The axial principle is especially pronounced here. The tree not only depicts the world, but becomes a route. It establishes movement upwards or downwards, connects the human world with other regions and allows the cosmos to be conceived as a multilevel structure. This is exceptionally important to comparative morphology: the tree is not merely an image of growth, but a model of transition among levels. Root, trunk and crown become not botanical parts, but stages of cosmic movement.

Within Turkic and Mongolian traditions, the tree may likewise be connected with origin, lineage, sky, earth, the sacred centre, vital force and vertical connection. In certain mythological narratives, it serves as a place of birth, nourishment, protection or connection with higher powers. For the present study, such images reinforce the general conclusion that the tree readily becomes a model of origin and growth. It unites beginning and expansion, root and branch, the

one and the many. Even where the particular narratives differ, the morphological scheme remains recognisable: a complex system develops from a single foundation.

The Chinese tradition also contains images of sacred and cosmic trees associated with the east, the Sun, immortality, celestial regions, islands of the blessed and mythological geography. Here, the tree may be associated not only with verticality, but also with cosmic direction, the cycles of celestial bodies, longevity, fruits of immortality and the harmony of the world. Within Daoist and wider Chinese symbolic systems, the tree also enters a broader complex of ideas concerning vital energy, natural elements, seasonality and cyclical renewal. This is important to morphological analysis because the tree expresses not only upward growth, but also the rhythm of time: spring, flowering, fruit, withering and renewal.

Within Mesoamerican cultures, particular significance attaches to the image of the tree connecting the levels of the world, the cardinal directions, the centre and the vertical. Among the Maya, the ceiba played an important role as a World Tree connecting the subterranean, earthly and celestial levels. Within this model, the tree not only grows upwards, but also organises space according to directions. It becomes the centre from which directions radiate. This is especially important to the hypothesis of the Matrix because vertical and radial organisation are united here. The tree possesses roots and a crown, while simultaneously being connected with the four cardinal directions, the centre of space and the orientation of the world. It becomes not only an axis, but also a cultural coordinate system.

Within African traditions, sacred trees may likewise signify the centre of a community, a place of connection with ancestors, and a space of assembly, justice, ritual, memory, fertility and protection. The particular species of trees and their functions differ among African cultures, but the role of the tree as a living centre of space is highly significant. The tree may be a place where people assemble, rituals are conducted, memory is preserved, and the living are connected with the dead. In this case, the tree is not so much a cosmological scheme in the strict sense as a social and sacred centre. Its morphological role nevertheless persists: it gathers space and community around itself.

Among many peoples, the tree also serves as an image of fertility and the feminine principle, as a sign of life, earth, nourishment, birth and reproduction. The fruit tree connects vertical growth especially clearly with the cycle of fruit and seed. It not only rises from the earth, but returns form to the seed. In this respect, the tree is one of the most complete models of A–B–C–D: the seed as the initial closed form; the shoot as the first opening; the trunk and branches as the unfolded structure; and the fruit and new seed as both completion and the beginning of a new cycle. Cultural images of the tree frequently preserve precisely this logic, even where they express it through myth, ritual or ornament.

It is especially important that the World Tree frequently unites verticality and multiplicity. Unlike a pillar, column or staff, the tree is not a pure axis. It possesses branches. It does not merely connect upper and lower, but also spreads sideways. This makes it a more complex model than the simple vertical. The pillar demonstrates connection among levels, but not expansion. The tree demonstrates both connection and development. It contains a centre without remaining confined to that centre. It possesses an axis without being exhausted by that axis. It extends its roots into the depths, rises through its trunk, spreads through its branches and returns through its fruit to the seed. The tree is therefore a universal model of growth in a fuller sense.

When different cultural traditions are considered comparatively, several persistent functions of the World Tree may be identified:

- Cosmological: the tree organises the world vertically and through levels.
- Genealogical: the tree expresses lineage, origin, ancestors and descendants.
- Vital: the tree symbolises fertility, growth, nourishment, renewal and immortality.
- Ritual: the tree becomes a place of transition, ascent, sacrifice or connection with gods and ancestors.
- Compositional: the tree organises an image or artefact as its central axis.
- Morphogenetic: the tree demonstrates the transition from unity to multiplicity through branching.

These functions may be combined within a single image or appear separately.

For the hypothesis of the Unified Matrix of the Universe, the morphogenetic function is the most important. The World Tree does not simply signify life. It reveals the structure of growth. It is a cultural model of how form develops: from a concealed foundation to a manifested vertical, from the axis to branching, from branching to a multiplicity of leaves and fruits, and from the fruit to a new seed. This logic unites the biological observability of the tree with the symbolic power of the cultural image. The World Tree may therefore be regarded as one of the strongest cultural analogues of a morphogenetic algorithm.

The word ‘analogue’, however, is fundamental here. The World Tree is not itself the algorithm of nature. It is a culturally recorded image of that algorithm. Culture perceives within the tree what the tree genuinely demonstrates: growth, root, axis, branching, levels, cyclicity and reproduction. Yet culture adds mythological, religious, social and metaphysical meanings to these features. Natural form and cultural interpretation are therefore inseparable within the World Tree. It is simultaneously a plant, symbol, model, image of the world and scheme connecting different levels. It is precisely this multilayered character that makes it an important subject of the present chapter.

Within comparative morphology, it is especially important that the World Tree exists not only within texts, but also within images, ornaments, ritual objects, architectural forms and the spatial organisation of sacred places. It may be drawn, carved, embroidered, sculpted, constructed or planted; enclosed within a boundary; employed as a real tree within a ritual; or transformed into an abstract sign. In every case, cultural form records particular morphological features: verticality, foundation, branches, levels, centre, symmetry, fruit, birds in the crown, animals among the roots and figures upon either side. Such material allows the World Tree to be considered not only as a mythologeme, but also as a scheme embodied in artefacts.

Images in which the tree occupies the centre of the composition, with animals, human beings, deities, birds, winged creatures or ritual figures positioned on either side, are particularly important at this level. Morphologically, such a composition is constructed around the tree as an axis. The right and left sides are balanced. The upper region may be connected with birds, celestial signs or the crown. The lower region may be associated with roots, animals, the earth or a vessel. The middle region may contain the trunk, stem, staff or vertical line. Even where the specific meaning of the scene depends upon its culture, the compositional role of the tree remains clear: it gathers space and transforms the image into a model of order.

The World Tree is also important because it unites the visible with the concealed. The roots are usually invisible, yet they nourish the tree. The trunk is visible and stable. The crown spreads through the air. The fruit emerges as the result of internal growth. The seed conceals the future form. This sequence makes the tree an especially useful model of the relationship between

concealed and manifested. The preceding chapters have already examined the bud, stone and artefact as forms in which the internal becomes external. The World Tree develops this theme: the concealed foundation does not merely open, but rises, branches, forms levels and returns to a new beginning through the seed.

The World Tree may therefore be understood as a cultural image of vertical time. In ordinary spatial perception, the tree possesses lower, middle and upper parts. Within cultural thought, however, these parts frequently become temporal:

- Roots is the past, ancestors and origin.
- Trunk is the present, the genealogical or vital line.
- Branches is the future, descendants and expansion.
- Fruit is the outcome.
- Seed is a new beginning.

The tree thereby connects space with time. It presents history as growth. The family tree is a direct example of this transference: biological and cultural memory are represented through a branching form.

This is especially important to the hypothesis of the Matrix because morphogenesis is always connected with time. Form does not exist solely as a spatial pattern; it passes through stages. The World Tree helps culture conceive stage-based development naturally. The seed becomes a shoot, the shoot a trunk, the trunk a tree, the tree bears fruit, and the fruit contains a seed. This cycle can be observed both within the natural tree and within its cultural model. The World Tree therefore becomes not only an image of structure, but also an image of process. It demonstrates that growth is not an arbitrary increase in size, but the lawful unfolding of an internal programme of form.

Different cultures may express this processual character in different ways. In some traditions, the tree is connected with the origin of the world. In others, it sustains cosmic order. In others still, it is associated with immortality or renewal, lineage and ancestors, ritual ascent or the fertility of the earth. Yet within all these variants, the tree retains one common feature: it connects levels and demonstrates a transition from foundation to multiplicity. This makes it a universally legible model. Even without knowledge of a particular myth, a person understands the tree as growth, verticality, branching and life.

Another methodological point must be emphasised here. The universality of the World Tree image does not mean that all cultures borrowed it from a single source. Cultural contacts and borrowing may have played a role in particular cases, but the widespread nature of tree symbolism also possesses a simpler explanation: the tree is one of the most evident natural images of growth. It is readily observable, economically useful, long-lived and connected with food, construction, fire, shade, fruit, death and rebirth. Different cultures could therefore have arrived independently at the image of the tree as a model of the world. Such independence does not weaken its morphological interest, but strengthens it: a comparable form of thought may arise from a comparable experience of observing nature.

In this respect, the World Tree may be compared with other widespread cultural motifs: the circle, mountain, river, Sun, snake, bird, seed and flower. The tree differs from them, however, in the completeness of its structure. The circle expresses wholeness, but does not demonstrate branching. The mountain expresses verticality, but does not produce fruit and seed. The river expresses flow, but does not possess a stable axis. The snake expresses movement, but does not

demonstrate levels. The flower expresses opening, but does not always convey prolonged growth or the connection between the subterranean and celestial. The tree partially unites all these elements: root, axis, branching, layer, edge, leaf, flower, fruit, seed and cycle. It therefore becomes an especially powerful model.

It is precisely this completeness that explains why the chapter concerning the World Tree occupies an independent place within the cultural and symbolic part of the study. Following the general chapter on the artefact, it is necessary to examine an image that is itself an almost complete morphogenetic scheme. The World Tree demonstrates how culture records growth not through abstract geometry, but through a living image. It unites the biological with the symbolic, the natural with the cultural, the local with the cosmic, and the bodily with the metaphysical. Within it, the Matrix manifests itself not as a mathematical diagram, but as an image that has remained intelligible to human perception for thousands of years.

At the same time, the World Tree must not be transformed into a universal key to every culture. It possesses its own meaning, context and limits within each tradition. Yggdrasil is not equivalent to the Indian *aśvattha*. The *aśvattha* is not equivalent to the Maya ceiba. The ceiba is not equivalent to the Mesopotamian sacred tree. The biblical Tree of Life is not equivalent to the shamanic tree of ascent. These images may nevertheless be placed within a comparative sequence according to morphological features: verticality, root, trunk, branches, levels, centre, connection among worlds, fruit, seed, repetition and growth. Such a comparative sequence does not eliminate their differences, but makes those differences visible against the background of a common structure.

Thus, the World Tree in different cultures may be regarded as one of the most persistent cultural means of representing the world in the form of growth. It demonstrates that human beings not only observed the tree as a plant, but also transferred its morphology to the cosmos, lineage, society, time, death, immortality, ritual and memory. Its universality lies not in the identity of myths, but in the recurrence of structural features. Root, trunk, branch, crown, fruit and seed form such a clear scheme of transition from concealed to manifested, from unity to multiplicity and from foundation to expansion that culture has repeatedly used it to describe the world.

The World Tree is therefore not merely a mythological symbol, but a cultural model of growth. It preserves the biological truth of the tree while translating it into the language of meaning. It demonstrates an axis without being reducible to a line. It demonstrates branching without being reducible to ornament. It demonstrates a connection among levels without being reducible to a cosmological scheme. It demonstrates reproduction without being reducible to fertility. It unites all the principal features that will be examined in detail in the following sections of the chapter: axis, root, trunk, branches, levels, self-similarity, fractality, concealed foundation, manifested body and expanding crown.

Within the hypothesis of the Unified Matrix of the Universe, the World Tree should be understood as a culturally established image of a morphogenetic algorithm. Ancient cultures did not formulate this algorithm in scientific language, but expressed it through an image: from an invisible foundation emerges a vertical; from the vertical, branching; from branching, a multiplicity of leaves, flowers and fruits; and from the fruit, a new seed. Such an image unites beginning and end, depth and height, unity and multiplicity, the concealed and the manifested. It therefore becomes a universal model of growth—not because all cultures are identical, but because the form of the tree itself provides human beings with one of the clearest means of conceiving the becoming of the world.

19.2. Axis, Root, Trunk and Branches

The World Tree as a cultural model of growth is constructed upon several persistent morphological features: centre, verticality, root, trunk, branches, levels and self-similarity. It is these features that make the tree not merely one natural image among others, but an almost complete scheme of the organisation of the world. Unlike many other symbols, the tree simultaneously demonstrates beginning, development, the connection among levels, the propagation of form and the return to a new cycle through fruit and seed. It is neither merely a vertical line, merely a growing organism nor merely a decorative motif. It is a complex morphological system in which concealed depth, a visible axis and open multiplicity are united within a single structure.

The first and most important feature of the World Tree is the axis. The tree grows vertically: upwards from the earth, from root to trunk and from trunk to crown. Even when a particular tree is inclined, curved or possesses a complex form, its morphological logic remains axial. It has a direction of growth. It connects the lower level with the upper. It organises the space around itself. This is precisely why the tree so readily becomes a cultural image of the world axis. Its verticality is not abstract geometry. It is presented as a living form: the axis is not merely drawn; it grows, thickens, branches and bears leaves, flowers and fruits.

Within cultural models of the World Tree, the axis normally connects three principal regions: lower, middle and upper. The lower region is associated with roots, earth, subterranean space, ancestors, the concealed foundation, sources of nourishment and dark potentiality. The middle region is associated with the trunk, the earthly world, the human level, stability, the body of the tree and its visible vertical. The upper region is associated with the crown, branches, leaves, birds, sky, light, gods, stars, fruits and the expansion of form. This tripartite structure is not identical in every culture, but its morphological basis is highly persistent: the lower is foundation, the middle is connection and the upper is opening.

The axis of the World Tree differs from a simple line because it is a living axis. A stone column may connect base and summit, but it neither branches nor bears fruit. A staff may signify power or verticality, but contains no internal cycle of growth. A mountain may connect earth and sky, but its form does not normally demonstrate the transition from unity to multiplicity. The tree, however, contains all these features simultaneously. Its axis is the trunk, and the trunk not only supports the crown, but also conducts sap, connects the root system with the leaves, and transports nutrients, water, minerals and the products of photosynthesis. The tree's axis is therefore not only geometry, but also a channel of exchange.

It is this feature that makes the tree especially important to the hypothesis of the Unified Matrix of the Universe. Within natural systems, the axis frequently performs an organising function: the stem organises the plant, the midrib organises the leaf, the valley organises the drainage network, the fault organises tension within relief, and the direction of ejection organises a cosmic shell. Within the World Tree, this axial function acquires a cultural and symbolic expression. The trunk becomes an image of the central channel through which the levels of form are connected. It demonstrates that the world may be conceived not as a set of disconnected regions, but as a vertically organised system.

The root is the second key feature of the World Tree. Within a biological tree, the root system is concealed within the earth, yet it provides stability, nourishment and connection with the depths. Roots hold the tree in place, collect water and substances, and interact with soil, fungi,

microorganisms, stones, moisture, darkness and the concealed processes of the earth. Within the cultural model, the root becomes an image of foundation, origin, ancestors, memory, an invisible beginning and deep-seated force. It demonstrates that visible form does not exist independently. Behind it there is always a concealed level that nourishes and sustains it.

This is especially important to morphological analysis. The root demonstrates that growth begins not at the visible summit, but within concealed depth. The tree is perceived primarily through its trunk and crown, yet its possibility is determined by its roots. Without the root, there is no vertical, stability, crown, foliage or fruit. In this sense, the root is a natural model of a concealed cause. It is not necessarily visible, yet it organises the entire tree. Within cultural symbolism, this readily becomes an image of ancestors, the primordial foundation, the underworld, genealogical memory, the source of life or a deep-seated law. The root connects form with what precedes its manifestation.

The root is also connected with the concept of the centre. At first sight, the centre of the tree appears to lie within the trunk or vertical axis. In a deeper sense, however, the centre of growth may be situated within the transitional region between root and trunk—where the concealed emerges into the manifested, the subterranean becomes terrestrial, and the horizontal network of roots gathers into the vertical trunk. This region is the tree's morphological node. It unites depth and height, the dispersion of the root system and the coherence of the trunk, concealed nourishment and visible growth. Symbolically, this node may correspond to the centre of the world, the birthplace of form or the point of transition between levels.

The root system also demonstrates branching, but of a distinctive kind. The branches of the crown open upwards and outwards, while the roots spread downwards and sideways. If the crown demonstrates the manifested propagation of form, the roots demonstrate concealed propagation. This is an important mirror relationship. The tree appears to possess two systems of branching: one visible and directed towards the light, the other concealed and directed into the earth. Within the cultural image of the World Tree, this relationship may be read as a connection between the manifested world and its invisible foundation. What opens above into leaves and fruits possesses its own invisible network below.

The trunk is the third key feature. It connects root and crown, concealed and manifested, earth and sky, foundation and propagation. The trunk differs from the roots and branches because it gathers form into a single vertical. It is the tree's body, support, channel and visible axis. Within the cultural model of the World Tree, the trunk frequently acquires the meaning of a path, pillar, ladder, world axis, central channel, genealogical line or connection among worlds. It is through the trunk that the tree becomes not only a plant, but also a structure of transition.

Morphologically, the trunk possesses a complex nature. It appears unified, yet internally contains layers: wood, cambium, phloem, bark, growth rings, vascular structures and traces of growth, damage, healing and time. It is not merely a smooth column, but an archive of the tree's life. Every year adds a layer. Every period of growth leaves a trace. Every bend, knot, fracture, thickening or ring records history. The trunk therefore unites verticality with time. It demonstrates not only the direction of growth, but also the accumulation of stages. In this respect, the trunk is close to the forms previously considered bearers of processual memory: stone, relief, shells and the surfaces of artefacts.

The trunk is also a boundary between the internal and external. Substances flow through its interior, while its exterior is protected by bark. Bark separates the tree from the environment while simultaneously interacting with it: it protects, cracks, thickens, becomes damaged, regenerates

and bears traces of climate, age and external influences. Within the cultural model, the trunk may be perceived as a stable centre, but morphologically it is dynamic. It grows, conducts, resists, ages, preserves and connects. The trunk of the World Tree is therefore not a dead vertical, but a living channel of form.

The branches are the fourth key feature. If the root demonstrates the concealed foundation and the trunk the central vertical, the branches demonstrate the propagation of form into multiplicity. Branching is one of the principal morphogenetic principles of nature. It occurs within trees, leaves, blood vessels, neural networks, river systems, lightning, fractures, corals, mycelia, deltas, the bronchial tree, and crystalline and fractal structures. Within the tree, this principle is expressed especially clearly: a single axis gradually divides into numerous directions, yet every direction remains connected with the original trunk.

The branching of the tree demonstrates the transition from unity to multiplicity. This is one of the most important morphological processes within the hypothesis of the Matrix. Form does not merely increase in size. It differentiates. A single line becomes two, two become four, large branches produce smaller ones, smaller branches produce shoots, and shoots produce leaves and flowers. The connection with the centre is preserved throughout this process, but diversity emerges. It is this that makes the tree such a powerful cultural model of the world. The world may be conceived as unified at its foundation, yet multiple in its manifestation. The tree demonstrates this logic visibly.

Branches also create levels. Large branches are situated closer to the trunk and bear smaller ones. Smaller branches bear leaves, flowers and fruits. The crown of a tree is not a chaotic mass. It possesses a hierarchy: branches of the first, second and third orders, shoots and leaves. Such hierarchy is especially important to cultural thought. The World Tree frequently becomes an image of a multilevel world because the tree itself possesses a multilevel organisation. It demonstrates that multiplicity may be organised not arbitrarily, but through an order of nested branching.

The branching of the tree is closely connected with self-similarity. Every branch in some respect repeats the tree on a smaller scale: it possesses its own axis, lateral offshoots, apex and connections with leaves and fruits. A branch resembles a small tree, a shoot an even smaller model, and leaf venation a scheme of branching upon a plane. This is not mathematically exact self-similarity, but natural, living and variable self-similarity. The principle is nevertheless recognisable: structure recurs at different scales. This is why the tree is so frequently used as a model of fractality, genealogy, classification, the development of knowledge, the propagation of life and systemic organisation.

The self-similarity of the tree is especially important to understanding the World Tree as a universal model. Within cultural symbolism, the tree may represent not only the cosmos as a whole, but also its individual parts. A lineage may be a tree. Knowledge may be a tree. Life may be a tree. The human body may be conceived through a trunk, branches, roots and flows. Social organisation may be represented as a tree. A language may possess roots, trunks and branches. Scientific classifications are frequently constructed as tree diagrams. This occurs because the morphology of the tree can readily be rescaled. The same principle of branching may be applied to different levels of organisation.

Levels are the fifth key feature. The World Tree almost always implies vertical stratification:

- Lower, middle and upper; root, trunk and crown.

- Subterranean, earthly and celestial.
- Past, present and future.
- Ancestors, the living and descendants.
- Seed, growth and fruit.
- Concealed, manifested and expanding.

This stratification may be mythological, ritual, social, cosmological or philosophical. Its morphological foundation, however, lies within the tree itself. The tree naturally divides space into zones. Culture transforms these zones into levels of the world.

It is important that the levels of the tree are not isolated. Root, trunk and crown are connected through flows. Water and minerals rise from the roots towards the leaves. The products of photosynthesis are distributed from the leaves to other parts of the tree. Growth depends upon exchange among levels. The tree is therefore not merely a vertical scheme, but a system of circulation. Within the cultural model, this may correspond to ideas concerning the connection among worlds, exchange between the earthly and celestial, the movement of vital force, the transmission of blessing, ascent and descent, ancestral memory and the continuation of lineage. The World Tree not only divides levels, but also connects them.

This connection among levels is especially important to the hypothesis of the Unified Matrix of the Universe. The Matrix is understood in this book not as a static geometric figure, but as a system of morphogenetic relationships. The tree demonstrates these relationships with particular clarity:

- A concealed foundation nourishes the visible axis.
- The visible axis generates branches.
- The branches create multiplicity.
- Multiplicity forms leaves, flowers and fruits.
- The fruit returns form to the seed.
- The seed once again becomes a concealed beginning.

This sequence contains a centre, axis, layer, branching, edge, opening, cycle and self-similarity. The tree may therefore genuinely be considered one of the most complete natural-cultural models of the Matrix.

The tree's relationship with the boundary is of particular significance. Branches and leaves form the edge of the crown—a complex, mutable and fractal boundary between the tree and air, light, wind and sky. Roots form a concealed boundary with the soil. Bark forms a boundary between internal flows and the external environment. The leaf creates a plane of exchange between the tree and light. The flower creates an open edge of interaction with pollinators. The fruit forms a shell around a new seed. Boundaries are present at every level of the tree. The World Tree is therefore not only an axial structure, but also a system of active edges. A culture may not formulate this scientifically, but the image of the tree already contains this multiplicity of boundaries.

The tree also demonstrates the relationship between closed and open forms. The seed is closed. The shoot ruptures its shell. The trunk gathers the vertical. The bud is once again a closed form. The leaf opens. The flower opens. The fruit creates a new shell. The seed within the fruit returns form to a closed state. The tree therefore contains an alternation of closure and opening. This brings it close to the A–B–C–D model, but makes it more complex because the cycle recurs repeatedly within different parts of the tree. Every bud is a small enclosed form, every flower an

opening, and every fruit a transition to a new seed. The tree as a whole is a system of multiple openings.

Within the cultural image of the World Tree, this logic is frequently expressed through fruit, flowers, leaves, birds, stars or signs upon the branches. The crown may be filled with symbols of life, light, celestial forces, souls, fruits, knowledge and generations. This is not arbitrary decoration. Morphologically, the crown is the region of propagation and multiplicity. It demonstrates the result of growth. If the root is the concealed beginning and the trunk the path, the crown is manifested completeness. This is why the upper part of the tree is frequently saturated with signs within cultural images. It represents not merely a biological mass of branches, but a region of manifested abundance.

The branches of the tree may also be understood as lines of possible development. Each branch proceeds in its own direction, yet all remain connected with a common trunk. This makes the tree a useful model of fate, lineage, history, knowledge, culture and language. Within a family tree, every branch indicates a line of descendants. Within a classification tree, every branch indicates a group. Within a tree of knowledge, branches represent fields of science or thought. Within an evolutionary tree, branches represent the divergence of forms of life. All these modern and ancient applications rely upon the same morphological principle: development as branching propagation from a common foundation.

From the perspective of the hypothesis of the Matrix, this is especially important because the tree demonstrates an algorithm of differentiation. The unified form does not disappear when it becomes multiple. It preserves its connection through the trunk, nodes and branches. The multiplicity is not chaotic because every branch possesses a place within the system. Difference does not destroy unity, but reveals it. This is what makes the tree such a powerful model of organic order. Within it, unity and multiplicity are not opposed, but connected through the process of growth.

The branching node is an important element in its own right. Branches do not emerge anywhere upon the tree. They proceed from the trunk or other branches at particular points and angles, depending upon the biological species, growth conditions, light, wind, damage and the internal programme of development. The branching node is the point at which form makes a decision concerning a new direction. Within the cultural model, such nodes may be interpreted as points of transition, generation, choice, division and propagation. The tree demonstrates that development occurs through nodes rather than through formless expansion. This is an important morphogenetic observation.

Within the World Tree, nodes may be symbolised by fruits, leaves, birds, flowers, stars, souls, generations or signs. Images of the sacred tree frequently contain recurrent symmetrical elements along the trunk or branches. These may possess a particular cultural meaning, but morphologically they demonstrate points of differentiation. Form does not merely grow, but generates recurrent nodes. These nodes make the structure legible. Without them, the tree would be merely a line; with them, it becomes a system.

If the World Tree were presented as an analytical scheme, several levels would need to be identified simultaneously: the root region, central vertical, branching crown, recurrent nodes, concealed and manifested zones, flows among levels, the fruit–seed cycle and self-similarity across scales. Such a scheme could serve as the first illustration (*Fig. 1*). It should not depict the tree as a specific ethnographic or religious symbol belonging to a particular culture. It would be preferable to present a generalised morphological model: roots below, the trunk as an axis,

branches as a system of self-similar propagation, the crown as open multiplicity, and fruits and seeds as the return of the cycle. Such an illustration would function not as a decorative image, but as a methodological map of the chapter.

It is important to remember that the World Tree as a cultural symbol cannot be reduced to botany. The natural tree provides the morphological foundation, but culture expands it. Roots become ancestors or the underworld. The trunk becomes the world axis. Branches become celestial levels, lineages, worlds or paths. Fruits become life, knowledge, immortality or the seeds of the future. Birds in the crown may represent souls, celestial beings, messengers or higher levels. Animals among the roots may represent subterranean forces, protectors, destroyers or guardians. The cultural model of the tree is always richer than the simple scheme. Yet it is precisely the morphological scheme that helps explain why such meanings could become associated with the tree.

Thus, axis, root, trunk and branches form the core of the World Tree as a universal model of growth. The axis establishes verticality and the connection among levels. The root represents the concealed foundation, nourishment, memory and origin. The trunk gathers form into a central channel and visible stability. The branches open the single axis into a multiplicity of directions. The levels divide the world into depth, middle and height, while the tree's flows connect these regions. Self-similarity demonstrates the recurrence of the same structure at different scales. Together, these features transform the tree into one of the most complete cultural models of morphogenesis.

This is of fundamental significance to the hypothesis of the Unified Matrix of the Universe. The World Tree demonstrates that culture is capable of recording not only an individual natural object, but the algorithm of growth itself: concealed foundation—axial vertical—branching—open multiplicity—fruit—new seed. This algorithm connects the biological form of the tree with a universal scheme of becoming. The World Tree should therefore not be regarded solely as a mythological narrative or religious symbol. It may be read as a culturally established model of form within which centre, verticality, levels, branching and self-similarity constitute a unified morphogenetic language.

19.3. The Tree and Fractality

The tree is one of the clearest natural images of fractality. A living tree is not, of course, a perfect fractal in the strict mathematical sense. Its branches do not repeat one another with absolute precision; branching angles vary; and growth depends upon light, soil, wind, moisture, damage, age and biological species. Yet it is precisely this imperfection that makes the tree especially important to comparative morphology. It manifests not abstract geometric fractality generated by a formula, but natural self-similarity: the recurrence of a structural principle at different scales while preserving living variability.

In the most general sense, fractality is associated with the recurrence of a form's organisation when moving from a larger scale to a smaller one. This is almost directly visible within the tree. The trunk divides into large branches. Large branches divide into smaller ones. Smaller branches become shoots. The shoots bear leaves. Within a leaf, the veins once again form a branching network: the midrib divides into lateral veins, the lateral veins into smaller ones, and these into the finest conducting lines. The tree thus appears to repeat itself within itself. A branch resembles

a smaller tree, a shoot resembles a smaller branch, and leaf venation resembles the branching of the crown. This is not a mechanical copy, but the recurrence of a structural principle.

This is why the tree is so frequently used as a model for the development of complex systems. It demonstrates how numerous directions may arise from a single foundation while remaining connected with the original axis. The fractality of the tree does not destroy its wholeness. On the contrary, it enables that wholeness to expand. If the tree consisted only of a trunk, it would remain a simple vertical. If it consisted solely of numerous branches without a trunk, it would disintegrate into a chaotic network. The tree, however, unites the one and the many: every branch possesses an independent direction, yet remains connected with the shared body. This is one of the most important morphogenetic ideas of the World Tree.

The fractality of the tree may be regarded as an economy of form. Nature does not create an entirely new scheme at every level. It repeatedly employs the same structural operation: a principal line generates lateral lines; the lateral lines generate further branches; and the branches create a surface of contact with the environment. This enables the tree to increase the area through which it interacts with air, light, moisture, space and living creatures. The crown is not an arbitrary accumulation of branches. It is a complex system for distributing surface area. The greater the branching, the wider the tree's area of contact with light and air. Fractality here possesses not only aesthetic, but also functional significance.

Biologically, the branching of the tree is connected with growth, resource distribution, photosynthesis, mechanical stability, the search for light and adaptation to the environment. For the purposes of the present chapter, however, what matters is not only the biological function, but also the morphological principle. The tree demonstrates that complexity may arise through the repetition of a simple rule. A single axis generates two or more branches. Each branch becomes a new local axis. Further lateral branches then proceed from it. This process may continue through several levels. The result is a form that appears complex but is constructed through the recurrence of a basic operation. This operation may be called the morphogenetic algorithm of branching.

This algorithm is especially significant to the hypothesis of the Unified Matrix of the Universe. Previous chapters have already examined forms in which structural recurrence appears within leaves, valleys, river networks, relief, nebulae, cosmic shells, fractures and the ornaments of artefacts. The tree unites many of these motifs. It possesses an axis, like the axis of an artefact or a trunk. It possesses a network, like a leaf or valley. It possesses a concealed foundation, like a root or seed. It possesses an active edge, like a crown or leaf surface. It possesses recurrent nodes, like an ornament. It possesses cycles of growth, like other biological forms. The tree is therefore not merely one example of fractality, but one of the most complete natural-cultural models of self-similar becoming.

The fractality of the tree manifests itself not only within its branches, but also within its roots. The root system is frequently organised according to a comparable principle: a principal root or several large roots divide into smaller ones, then into still finer roots, and finally into the smallest rootlets and root hairs through which the tree interacts with the soil. If the crown opens the tree upwards and outwards, the roots open it downwards and sideways. The tree's visible and concealed parts form what appear to be mirrored systems of branching. This is especially important to the symbolic analysis of the World Tree: the tree is self-similar not only within its manifested crown, but also within its concealed foundation. Multiplicity is present both above and below, but one multiplicity is visible while the other remains concealed.

Such mirrored branching allows the tree to be considered a model connecting two fractal regions: subterranean and terrestrial. The roots interact with a dark, moist and mineral environment. The branches interact with light, air, wind and sky. The trunk connects these regions. Within the cultural image of the World Tree, this relationship is frequently transformed into a connection between lower and upper worlds. Morphologically, however, what matters is that both regions are organised through branching rather than chaos. The tree appears to declare that the concealed foundation and manifested propagation are governed by the same principle. Their environments and directions differ, but the scheme recurs.

The fractality of the tree is also connected with the node. Every branching occurs at a particular point where the previous line ceases to be singular and generates new directions. The node is the site of transition from unity to multiplicity. Within the living tree, such nodes are biological in nature: they are connected with buds, shoots, growth zones, the hereditary programme of the species and responses to environmental conditions. Morphologically, the node is a point of unfolding. It is through nodes that the tree becomes fractal. Without them, the trunk would remain a continuous axis. Through them, it becomes a system.

Within cultural symbolism, the nodes of the tree may correspond to important points of the world: levels, worlds, generations, stars, fruits, souls, forms of knowledge and branching paths of destiny. Within images of the World Tree, such nodes are frequently represented by fruits, flowers, leaves, birds, rosettes, circles, sacred signs or symmetrical elements. They may be considered not only decorations, but also records of the places where form enters a new direction. This is morphologically important: the World Tree demonstrates not only verticality, but also a structure of generation. It reveals where unity begins to become multiplicity.

The fractality of the tree is especially apparent in the relationship between crown and leaf. At first sight, the crown and leaf belong to different scales. The crown is a large spatial system, whereas the leaf is an individual organ. Yet a close examination of the leaf reveals that its venation repeats the tree-like principle. The midrib performs the role of the trunk, the lateral veins the role of branches, the minor veins the role of shoots, and the tissue network the role of a distributed surface. The leaf is a kind of planar miniature of the tree. Within one of its organs, the tree repeats its general morphology. This is one of the most expressive examples of natural self-similarity.

Such self-similarity possesses important philosophical meaning. The part does not merely belong to the whole; it contains the principle of the whole. The leaf is not a copy of the entire tree, but its structure recalls the tree's general algorithm. The branch is not a complete tree, but repeats its logic: axis, lateral branches, leaves and a growing tip. The root is not the crown, but it too branches. The tree thus demonstrates a distinctive relationship between part and whole. The whole manifests itself within its parts not through literal duplication, but through the recurrence of a structural principle. This is fundamental to the hypothesis of the Matrix: the Matrix may be understood not as an identical form repeated mechanically, but as an algorithm manifested within different parts through comparable relationships.

The fractality of the tree also helps explain its cultural universality. Human consciousness readily employs the tree-like scheme to describe complex phenomena because it is simultaneously simple and multilevel. It can demonstrate origin, development, branching, the connections among parts, hierarchy, kinship and propagation. The family tree demonstrates generations. The language tree demonstrates the origins and branches of language groups. The tree of knowledge demonstrates the division of the sciences. The evolutionary tree demonstrates the divergence of species. The decision tree demonstrates alternative choices. The concept tree demonstrates

classification. All these models employ the same fractal principle: movement from a common foundation towards multiple connected directions.

The World Tree in mythology and culture is an early and especially vivid form of this scheme. It does not divide sciences, species or concepts in the modern sense, but it demonstrates the same principle of development: the world possesses a foundation, axis, levels and branches. It makes complexity visible. Human beings may lack the abstract language of systems theory, yet they perceive the tree and understand that multiplicity can grow from unity. The tree therefore becomes a universal symbolic instrument. It makes it possible to conceive the world as a living hierarchy in which every part remains connected with the whole.

In the context of fractality, it is important to distinguish between hierarchy and a mechanical staircase. A staircase possesses levels, but does not branch. A column possesses height, but does not generate lateral structures. A pyramid possesses levels, but narrows towards its summit, whereas the tree opens into its crown. The tree demonstrates a hierarchy of an organic type. The lower levels are not simply lower, but nourish the upper. The upper levels are not merely higher, but expand the surface of life. The branches are not separated from the trunk, but continue it. A tree-like hierarchy is therefore not a rigid administrative scheme, but a living structure of connection and distribution.

The fractality of the tree is also connected with the concept of scale:

- At the large scale, we perceive the tree as a single silhouette: the roots are concealed, the trunk rises and the crown opens.
- At the intermediate scale, we perceive the large branches.
- At the small scale, we perceive shoots, leaves, buds and flowers.
- At a still smaller scale, we perceive leaf veins, cells, wood fibres, growth rings and vascular structures.

Every scale reveals new levels of form, yet the general principle of connection persists. This makes the tree especially suitable for the philosophy of form: it demonstrates that the visible whole consists of nested structures, each possessing its own organisation.

When the World Tree is considered as a cultural image, scale acquires another meaning. A single tree may represent the entire cosmos. A single branch may signify an individual world or lineage. A single fruit may signify fate, knowledge, life or a new possibility. A single leaf may signify a soul, person, word or event. The cultural model thus employs the morphological scaling of the tree for symbolic thought. The part becomes an image of the whole, and the whole an image of a multiplicity of parts. This is why the World Tree is so frequently capable of uniting cosmology, genealogy, ritual, ethics and the natural cycle.

The fractality of the tree may also be understood as a visual form of memory. The trunk preserves growth rings, branches preserve the history of growth, knots retain traces of former branches, bark preserves damage, the crown reveals environmental conditions, and roots record interaction with the soil. The tree does not merely grow; it records its development within its own structure. In this respect, it resembles stone, relief and the artefact, which likewise preserve traces of becoming. The tree, however, does this in a living manner. Its memory does not exist separately from its form; it is its form. Every branch demonstrates that a particular path of growth was once taken. Every ring records a year of life. Every asymmetry of the crown speaks of light, wind, damage and neighbouring trees.

Within cultural symbolism, this memory is readily transferred to lineage and history. The family tree preserves the memory of generations. The sacred tree may be associated with ancestors. A tree at the centre of a community may preserve the memory of assemblies, decisions and rituals. A mythological tree may preserve the structure and history of the world. The tree therefore becomes not only a model of growth, but also a model of the memory of growth. Here, fractality means that the past does not disappear: it remains incorporated into branches, layers, nodes and rings. The world develops, but its development leaves traces. It is preserved within form.

From the perspective of the Unified Matrix of the Universe, this is especially significant. If the Matrix describes not only form, but also the process of form generation, the tree demonstrates how process becomes structure. The growth of a tree does not disappear when a particular stage is completed. It remains within the trunk, branches, nodes, rings, bark and crown. The same applies to other natural systems: process leaves form. Water creates a valley, pressure a fold, an explosion a shell, growth a leaf and culture an artefact. The tree is one of the clearest examples of this general principle: becoming becomes a visible body.

The fractality of the tree also helps refine the concept of the ‘universal algorithm’. Here, an algorithm should not be understood as a literal computer program. What is meant is a recurrent sequence of form-generating operations:

- The emergence of a centre or foundation.
- Movement along an axis.
- Division into lateral directions.
- Repetition of the division.
- Formation of a network.
- Expansion of surface area.
- Emergence of nodes.
- Transition to new units of growth.
- Return to the beginning through the seed.

Within the tree, this algorithm manifests itself naturally. Within culture, it is recorded symbolically. In other natural systems, it may manifest itself through different mechanisms. Yet the logic itself—from unity to multiplicity through recurrent branching—remains exceptionally persistent.

It must be emphasised that this persistence does not imply identical causes. Within the tree, branching is associated with biological growth; within a river network, with the movement of water and relief; within lightning, with electrical discharge; within fractures, with material stress; within the vascular system, with the distribution of fluid through an organism; within cosmic filaments, with gravitational and gaseous dynamics; and within artefacts, with the cultural stylisation of line. The mechanisms differ, but the morphological principle of branching recurs. This makes fractality one of the key bridges between natural and cultural morphology.

The tree is especially suitable for explaining this bridge because it is simultaneously a real living object and a cultural symbol. When human beings employ the tree as an image of the world, they rely upon real natural fractality. They may not measure it mathematically, but they perceive it. They see that a branch resembles a tree, that roots resemble an inverted crown, that leaf veins resemble minor branches and that a single fruit contains the seeds of future trees. This observation is naturally transformed into a symbol. The World Tree may therefore be regarded as a cultural record of the fractal principle of growth.

The fractality of the World Tree is also connected with the recurrence of levels within the mythological image of the world. If the world is divided into several regions, each may possess its own beings, paths, centres, boundaries and transitions. The World Tree connects these regions without eliminating their differences. It enables the cosmos to be conceived as a multilayered system in which every level is part of the whole. In this sense, the mythological model of the world may be read as a cultural form of nested scales. The lower, middle and upper worlds are different, yet connected by a single axis. This is not a mathematical fractal, but a structural model of recurrence across levels.

The visual illustration for this section may demonstrate the fractality of the tree as a sequence of scales (*Fig. 2*). Such a scheme might present the tree as a whole, then isolate a large branch, a smaller branch, a leaf with its venation and, perhaps, the root system as a mirrored branching structure. The illustration should demonstrate that the same principle—an axis and lateral branching—recurs at different levels. At the same time, the image should not be excessively mathematised. It should preserve the natural vitality of the tree while offering analytical clarity. Such an image would enable the reader to see that the fractality of the World Tree is not an arbitrary metaphor, but an observable structure of living form.

The fractality of the tree must not, however, be romanticised. A living tree does not grow according to a perfectly symmetrical template. It responds to chance, damage, competition, disease, climate, soil, light, gravity, animal activity and human intervention. Its form is always unique. This is why natural fractality differs from ideal geometry. It is probabilistic, adaptive and historical. Every tree repeats a general principle, yet the outcome is always individual. This is important to the hypothesis of the Matrix: a universal invariant does not destroy the individuality of form. On the contrary, it manifests itself through numerous particular variations.

This understanding helps prevent oversimplification. To say that a tree is fractal is not yet to understand the tree. It is necessary to perceive that its fractality is living, limited, functional, historical and environmental. It depends upon growth, and growth always occurs under particular conditions. The World Tree as a cultural symbol should likewise not be understood as an abstract scheme without a history. Within each culture, it acquires its own appearance, branches, levels, beings, fruits, prohibitions and rituals. A common morphological principle exists, but every cultural image opens it in its own way.

The fractality of the tree is also connected with the theme of limits. Branching cannot continue infinitely. Natural constraints include energy, nourishment, mechanical strength, leaf area, wind force, age, genetic programme and seasonality. The tree therefore grows not into an infinite abstract network, but towards a particular form. The crown possesses an edge. The roots possess a limit of propagation. Branches possess a finite thickness. The leaf possesses a completed contour. The fractality of the tree is not infinite, but is constrained by the body of the organism. This is important to morphology: all natural self-similarity possesses limits. If the Matrix is understood as a system of form-generating invariants, it too must be conceived not as infinite repetition, but as recurrence within the limits of material, energy, function and environment.

Within the cultural image of the World Tree, this limit may be expressed through the crown, celestial vault, fruit, boundary of the world, summit, bird, star or sacred point. The tree reaches upwards without dissolving into infinity. It connects levels while preserving form. Its crown expands but possesses a contour. Its roots descend into the depths but remain connected with a particular foundation. The World Tree is therefore a model of ordered multiplicity rather than infinite chaos. Its fractality is always gathered around an axis and centre.

This distinguishes the tree from certain other networked forms. A river network may spread across a basin, but its centre may be less evident. Fractures may branch, but frequently possess no single axis. Lightning may be tree-like, but its form is transient. Mycelium may constitute a network, but its structure is concealed and more distributed. The tree, however, combines fractality with a vertical axis. This makes it especially suitable for cultural thought: it is simultaneously network and centre, multiplicity and trunk, branching and verticality. The World Tree expresses not fractality in general, but the axial fractality of growth.

Axial fractality may be considered one of the key features of the World Tree. It means that structural recurrence occurs not within a completely dispersed field, but around a central line. The trunk remains the principal organising element even as the branches diverge. This makes the tree a model of hierarchically organised growth. Within culture, such a model is readily transferred to conceptions of the world, power, lineage, knowledge and the spiritual path. There is a centre, there are levels and branches, but everything remains connected with the original vertical. This is why the World Tree is not only fractal, but also cosmologically persuasive.

The fractality of the tree also helps clarify its relationship with cyclical time. Every branch passes through its own stages of growth. Every bud may become a leaf, flower or new branch. Every fruit contains a seed from which a new tree may grow. The fractality of the tree is therefore not only spatial, but also temporal. The tree repeats itself not only within the structure of its branches, but also within its life cycles. The seed contains the future form of the tree in potential. The new tree repeats the general algorithm of the parent tree while becoming an individual. This combination of structural and temporal self-similarity is especially important to the hypothesis of the Matrix. Form recurs not as a copy, but as a new cycle.

Culturally, this makes the World Tree an image of the reproduction of the world. The world is not merely created once; it is sustained, renewed, passes through cycles, bears fruit and generates new forms. Within genealogical symbolism, this is evident: descendants repeat the genealogical line, yet each remains an individual. Within mythological cosmology, the tree may signify the continual renewal of connections among worlds. Within ritual, it may be associated with the recurrence of the calendrical cycle. Within sacred art, it may demonstrate an order restored repeatedly through the image. The fractality of the tree thus unites space, time and repetition.

This is why the tree as a fractal model is highly significant to the chapter's subsequent conclusion. The World Tree may be regarded as a culturally recorded image of a morphogenetic algorithm not only because it possesses roots, a trunk and branches, but also because its structure recurs within itself and generates new cycles. It demonstrates that growth is not a simple line. Growth is a branching, self-similar, multilevel and cyclical opening of form. This idea will be especially important when the tree is subsequently considered as a model connecting levels and as one of the key cultural images of the Unified Matrix.

The fractality of the World Tree should therefore be understood broadly but rigorously. Broadly, because it encompasses branches, roots, leaves, venation, nodes, cycles, genealogies, cultural schemes and the recurrence of the image at different scales. Rigorously, because what is at issue is not perfect mathematical self-similarity, but the natural and cultural recurrence of a structural principle. The tree is not a formula, but it is a living model. It demonstrates how a unified foundation can generate multiple connected forms, how a part may contain the principle of the whole, how growth may preserve the memory of its stages and how a new cycle may arise from fruit and seed.

This is the significance of the tree to the hypothesis of the Unified Matrix of the Universe. Through the tree, culture acquires an image of fractal growth accessible to direct perception. Human beings perceive within the tree what they subsequently transfer to the world: branches of worlds, lineage, knowledge, life and destiny. This transfer is not arbitrary. It is based upon the tree's actual morphology. The World Tree may therefore be considered one of the most persuasive examples of how natural fractality becomes cultural symbolism, while cultural symbolism in turn preserves the memory of a morphogenetic principle.

19.4. The Tree as a Model of Connection Among Levels

The World Tree is not only a model of growth and branching, but also one of the clearest cultural models of connection among levels. Its strength lies in its simultaneous demonstration of a vertical, a concealed foundation, a manifested body, an upper region of propagation, internal flows and the cyclical return of form to a new beginning. Unlike a simple axial line, the tree does not merely connect lower and upper. It demonstrates how these levels pass into one another, nourish and transform one another, and form a single living system. This is why the tree became such a persistent image of the world within different cultures: it allows the cosmos to be conceived not as a flat space, but as a multilevel structure in which depth, middle and height are connected through the process of growth.

Root, trunk and crown form the tree's three principal zones. Biologically, they are parts of a single organism. In cultural and morphological terms, they may be read as a model of transition among the concealed, manifested and expanding levels of form. The root is associated with what lies below and is normally invisible. The trunk is associated with what becomes visible, stable, vertical and load-bearing. The crown is associated with what opens into space, multiplies, branches and interacts with light and the environment. Through this tripartite structure, the tree demonstrates one of the principal laws of morphogenesis: form does not emerge immediately into complete visibility; it rises from a concealed foundation, passes through an axial body and opens into multiplicity.

Within this model, the root corresponds to the concealed level of form. It lies within the earth, in darkness and in an environment inaccessible to direct observation. Yet this is where the tree's most important work occurs: anchoring, nourishment, the search for moisture and interaction with soil, minerals, microorganisms, fungal networks, stones, groundwater and deep-seated processes. The root is not a passive foundation. It is active, although its activity is concealed. It not only holds the tree in place mechanically, but creates the possibility of all subsequent growth. Within the cultural image of the World Tree, the root is therefore naturally associated with ancestors, the underworld, beginnings, memory, depth, source, potentiality and invisible order.

The concealment of the root is of fundamental significance. An external observer perceives the trunk and crown, but not most of the root system. Yet the invisible is not secondary. On the contrary, it is precisely the invisible foundation that makes visible form possible. This idea is important to the entire hypothesis of the Unified Matrix of the Universe. The relationship between visible and concealed has repeatedly appeared within different natural and cultural forms:

- The seed conceals the future form of the plant.
- The bud conceals the future flower.
- The stone conceals its internal structure.

- The planetary surface conceals deep-seated shells.
- The artefact conceals an internal cultural image that is subsequently brought to its surface.

The World Tree unites all these motifs within a single visible vertical model.

The root may be understood as a region of potentiality. It is not yet the crown, but the crown is impossible without it. It bears no fruit, but creates the conditions for fruiting. It does not open into the air, but nourishes opening. Form is present within it not as external completeness, but as the foundation of growth. This brings the root close to the seed, although root and seed are not identical. The seed is the initial closed form from which the tree emerges. The root is an already unfolded but concealed system that sustains the tree's further existence. Culturally, both motifs are connected with beginnings, but the seed expresses compressed potentiality, whereas the root expresses the deep-rootedness of form.

The trunk corresponds to the manifested level. It emerges from the earth, rises upwards, becomes a visible vertical and connects the root region with the crown. In spatial perception, it is the trunk that makes the tree recognisable as a tree. Through it, human beings perceive the tree's vertical force, age, stability, direction of growth and connection with the earth. Within the model of the World Tree, the trunk becomes the axis between levels. It not only lies between the root and crown, but connects them functionally. Flows pass through it; it bears weight, distributes loads, accumulates layers, protects internal conducting tissues with its bark, and preserves traces of time and damage.

Morphologically, the trunk is a form of transition. It is not completely concealed like the root or distributed into multiplicity like the crown. It is coherent, directed and stable. It represents the stage at which the concealed foundation has already become visible, but has not yet unfolded into full multiplicity. Within the A–B–C–D model, the trunk may be considered a stable axial phase in the development of form: the form has already emerged from its initial concealed state, but its principal energy remains concentrated within a vertical channel. The trunk demonstrates that manifestation begins not with dispersion, but with axial coherence. Form must first acquire a direction before it can branch.

The trunk is especially important because it is a channel of exchange. It conducts water and minerals upwards and the products of photosynthesis downwards and sideways, connects the root system with the leaves, and provides mechanical stability and growth. Within the cultural model, this readily becomes an image of mediation. The trunk connects the lower and upper worlds, ancestors and descendants, earth and sky, concealed and manifested, foundation and fruit, material and spiritual. This is why, within many traditions, the World Tree is associated not only with the cosmic vertical, but also with movement between levels: ascent, descent and the transmission of force, blessing, knowledge, life or memory.

The crown corresponds to the propagating level of form. It opens into space, branches, produces leaves, flowers and fruits, creates shade, and interacts with light, air, wind, birds, insects, rain and the surrounding environment. If the root is associated with concealed depth and the trunk with the manifested axis, the crown is associated with multiplicity and the manifested richness of form. It demonstrates that growth does not stop at the vertical. The axis of the tree must open, extend sideways, create a network, surface, leaves, edges and fruit-bearing zones. The crown is the upper region not simply because it is physically higher, but because form attains its maximum differentiation within it.

The crown makes the power of branching visible. Within it, the unified trunk becomes a multiplicity of directions. Yet this multiplicity is not chaotic: it preserves its connection with the axis and root. Every branch receives nourishment through the trunk and root system, and every leaf participates in the tree's general exchange. The crown is therefore a model of organised multiplicity. Within cultural symbolism, it may signify the celestial region, spiritual level, descendants, fertility, higher manifestation, multiple worlds, starry space, divine blessing or the open completeness of life. Morphologically, however, its significance lies in the fact that the concealed foundation and central vertical attain the state of propagated form.

The transition from trunk to crown is especially important. At this point, the axis begins to branch. A single direction ceases to be the only one and generates numerous paths. This transition may be considered a morphological moment of opening. The root is concealed, the trunk manifested and the crown open. It is the crown that demonstrates that form not only exists, but also propagates. Within it, a space of possibilities emerges: every branch may produce new shoots, leaves, flowers, fruits and seeds. The crown is therefore not a final, immobile summit, but a region of further generation. It completes one level of growth while simultaneously opening the next.

The World Tree is an especially powerful model of connection among levels because its levels are not isolated. The root does not exist separately from the trunk, the trunk separately from the crown or the crown separately from the root. If the roots are damaged, the entire tree suffers. If the trunk is disrupted, the flow between levels is interrupted. If the crown dies, the tree loses its ability to exchange fully with light and air. The tree therefore demonstrates not a hierarchy of disconnected layers, but a system of interdependence. The lower nourishes the upper. The upper returns energy to the lower. The middle connects both directions. Such a model is exceptionally important to the philosophy of form: a level does not exist independently, but acquires meaning only through its relationship with other levels.

The World Tree should therefore not be understood as a simple vertical scale. It does not merely state that lower, middle and upper exist. It demonstrates that there is a flow among them. Water rises. Organic substances are distributed downwards and sideways. Growth signals move through tissues. Branches respond to light, roots to moisture and soil, and the trunk to mechanical loads. The entire tree remains in a state of constant internal exchange. Within the cultural model, this may correspond to the movement of vital force, spiritual energy, memory, blessing, genealogical continuity or cosmic order. Yet even without symbolism, the biological structure of the tree already demonstrates that the connection among levels is a process rather than a scheme.

This allows the concept of the Matrix to be refined. If the Matrix is understood as a universal structure of form, it should not be flat. It must include levels and transitions among them. The World Tree demonstrates precisely such a multilevel organisation. The root corresponds to the deep foundation within which form remains concealed or exists in a state of nourishment and memory. The trunk corresponds to axial manifestation, within which form acquires stability and direction. The crown corresponds to propagation, within which form becomes multiple, open and interactive with its environment. Fruit and seed return this system to a new beginning. The tree thus presents the Matrix as a vertical and cyclical model of growth.

An important feature of the tree is that the concealed and manifested levels are not opposed to one another. Within certain cultural and philosophical systems, the concealed may be regarded as more authentic and the manifested as secondary. In the tree, such an opposition proves inadequate. The root is important, but without the trunk and crown it does not realise the tree as

a complete form. The crown is visible, but impossible without the root. The trunk is stable, but without branches and leaves it does not complete the life cycle. The tree therefore demonstrates not the superiority of one level over another, but the necessity of their connection. Concealed, manifested and propagating are phases of a single form.

This idea is highly significant to cultural analysis. Within the World Tree, the lower level is not always exclusively dark or negative, nor the upper exclusively light or positive. Meanings differ among cultures, but morphologically the lower level is the source, the upper is opening and the middle is connection. The lower may be associated with ancestors, earth, water, death, seed and subterranean forces. The upper may be associated with sky, light, birds, gods, fruits and stars. The middle level may be associated with human beings, the trunk, earthly life and transition. These meanings, however, should not become a rigid moral scheme. The tree demonstrates that every level is necessary to the whole.

The root may also be read as memory. It connects the tree with a place. The tree does not merely occupy space; it is rooted. Rootedness means a connection with soil, time, conditions, locality, depth and the past. Within the cultural model, this becomes a connection with ancestors, lineage, land, tradition and beginnings. The trunk demonstrates the continuation of this memory within a visible line of growth. The branches and crown demonstrate the propagation of memory into the future. The tree as a model of connection among levels is therefore simultaneously a model of the connection among times. The root is the past, the trunk the present, the crown the future, and fruit and seed the return of the future to a new beginning. In this sense, the World Tree is not only a vertical, but also a temporal structure.

This temporal interpretation is especially important to the family tree. Within it, the roots or foundation correspond to ancestors, the trunk to the principal genealogical line, and the branches to descendants and collateral lines. The family tree is a social and cultural application of the tree's morphology. It demonstrates that human memory naturally conceives origin and development through branching. Behind this social scheme, however, lies a deeper morphological principle: the new does not arise within emptiness; it is connected with a foundation, passes through a line of continuity and propagates into multiplicity. This is the same principle that the World Tree expresses cosmologically.

The tree as a model of connection among levels also helps clarify the relationship between depth and height. In ordinary perception, the tree grows upwards. Yet the taller the tree, the greater the importance of its root system. Height requires depth. Propagation requires rootedness. The larger the crown, the more important the foundation. This morphological relationship can readily be transferred into the philosophy of culture: higher forms of meaning do not arise without a deep foundation; propagation is unstable without roots; and a vertical cannot stand without a concealed system of nourishment. The World Tree therefore demonstrates not only an aspiration upwards, but also the necessity of depth.

This idea is especially important to the hypothesis of the Unified Matrix of the Universe because it cautions against a superficial understanding of opening. Opening is not merely outward movement. It requires an internal foundation. The flower opens because it was preceded by a bud, stem, root and the entire system of the plant. The artefact opens a cultural form because behind it lie tradition, image, gesture, material and meaning. The tree opens its crown because it possesses roots and a trunk. Every manifestation of form must therefore be considered together with what nourishes it. The World Tree makes this principle visible.

The tree also possesses horizontal propagation. The crown spreads sideways, as do the roots; branches encompass space; and leaves create a surface of interaction with light. The World Tree is therefore not merely a vertical scheme. It unites verticality with horizontality. The vertical connects levels, while the horizontal propagates form. Within the cultural model, this may correspond to the relationship between centre and cardinal directions, axis and world, trunk and space, lineage and collateral lines, or a spiritual centre and multiple manifestations. This is especially apparent within traditions in which the tree is associated not only with upper and lower, but also with the four directions of the world.

This combination of vertical and horizontal makes the tree a spatial model. The root descends, the trunk rises, the branches extend sideways, the crown forms volume, the leaves create surface, and the fruits return form to the seed. In this sense, the tree organises space in every direction. It does not merely occupy a place, but structures it. The trunk stands at the centre; the region of the crown forms around it; the root zone lies beneath; the sky above; and shade, soil and other living beings surround it. A real tree thus already creates a microcosm around itself. Culture could perceive this microcosm as a model of the larger cosmos.

The World Tree is frequently associated with birds, animals, snakes, fruits, springs, celestial bodies and human figures. These elements are not arbitrary. They demonstrate that the tree is a meeting place of different levels of the living and symbolic. Birds in the crown connect the tree with the sky. Animals beside the trunk or roots connect it with the earth. A snake among the roots may connect it with subterranean, aquatic or cyclical principles. Fruits connect the tree with food, seed and reproduction. A human figure beside the tree connects it with ritual, memory, choice, knowledge or lineage. The tree thereby becomes not an isolated object, but the centre of a network of relationships.

Morphologically, this means that the tree is an open system. It does not exist solely through itself. It is connected with soil, water, light, air, animals, fungi, microorganisms, climate, time and space. The cultural image of the World Tree preserves this openness by translating it into symbolic language. The tree connects levels not because it is isolated, but because it participates in numerous relationships. In this respect, the World Tree is a model not only of growth, but also of ecological interdependence. Modern language might describe the tree as a node within a network. Ancient culture expressed this through the image of the centre of the world.

It is also important that the tree combines vertical stability with change. The trunk may survive for decades or centuries, while leaves emerge and fall every year. Flowers open and disappear. Fruits ripen and fall. Branches grow, break, die and are replaced. Bark changes, roots deepen and the crown is restructured. The tree is therefore a stable form within which constant renewal occurs. Within the cultural model, this enables the world to be conceived as an order preserved through cycles of change. The World Tree is not a dead structure; it lives, renews itself, passes through the seasons and preserves the connection among levels through change.

This relationship between stability and change is especially important to understanding the Matrix. If the Matrix were merely an unchanging scheme, it could not explain living becoming. If it were merely a flow of changes, it would provide no form. The tree unites both aspects. Its axis is stable, but its branches grow. Its roots are anchored, but seek new paths. Its crown possesses a silhouette, but changes. Its cycle recurs, but every year is unique. This combination of stable invariant and variable growth is one of the principal ideas of the entire hypothesis. The World Tree makes it culturally visible.

If the tree is conceived as a model of transition among concealed, manifested and propagating levels, several successive relationships may be identified. First, the concealed nourishes the manifested: the root nourishes the trunk. Second, the manifested connects the concealed with the open: the trunk connects root and crown. Third, the open returns energy to the system: the leaves and crown produce the substances required by the tree. Fourth, the open generates a new concealed form: the fruit creates the seed. Fifth, the new concealed form may once again become the foundation of growth: the seed produces a new tree. Through this sequence, the tree demonstrates a closed yet developing cycle of form.

Such a cycle is especially important to the philosophy of morphogenesis. It possesses no final stopping point. The crown is not an end because it produces fruit. The fruit is not an end because it contains a seed. The seed is not an end because it may generate new growth. The root is not an absolute beginning because it was preceded by the seed. The trunk is not a centre in itself because it is connected with root and crown. The tree as a whole is a process that assumes form. The World Tree may therefore be interpreted as a cultural model of continuous transition among levels.

The visual illustration for this section may present the World Tree as a vertical scheme of three levels (*Fig. 3*). The lower zone would contain the root system as concealed foundation, memory, nourishment and potentiality. The middle zone would contain the trunk as manifested axis, channel and stable body of form. The upper zone would contain the crown as propagating multiplicity, branching, leaves, fruits and an open region of interaction with the environment. Upward and downward flows should be indicated between the levels so that the tree is perceived not as a static pyramid, but as a system of exchange. Such an illustration should not be a decorative depiction of a tree, but an analytical scheme of the connection among the concealed, manifested and propagating.

The image should not be tied to any single culture. The World Tree is considered within this chapter as a generalised morphological model rather than a reconstruction of Yggdrasil, the *aśvattha*, the ceiba or the Mesopotamian sacred tree. The illustration should therefore demonstrate universal features: root, trunk, branches, levels, flows, fruit and seed. If cultural motifs are added, they should remain conventional and neutral—for example, birds in the crown, seeds or fruits, lines indicating a subterranean level, or a luminous region above the crown. The principal purpose is not to create a new mythological image, but to explain visually the tree's morphological function as a model connecting levels.

The tree as a model connecting levels also possesses anthropological significance. Human beings perceive their own bodies vertically: the feet are connected with the earth, the spine forms an axis, the head faces upwards and the arms extend sideways. In this respect, the tree resembles the human body: roots resemble a foundation, the trunk a body, branches arms, and the crown a head or an open space of consciousness. It is possible that this bodily analogy strengthened the cultural significance of the tree. Human beings recognised within it not only a natural form, but also the vertical structure of their own existence. The World Tree could therefore become an image not only of the cosmos, but also of the human being, lineage, soul, path and ascent.

This bodily connection is especially important within ritual practices in which a tree, pillar, pole, ladder or vertical object was employed as a means of transition between levels. Human beings could move around the tree, ascend it symbolically, address it, offer sacrifices, associate it with ancestors or spirits, and mark the centre of a community beside it. In such cases, the tree did not

merely depict a connection among levels, but incorporated the human being into that connection. It became a spatial and bodily model of transition. This once again confirms that the World Tree is not only an image of the world; it may also constitute a practice of relating to the world.

Philosophically, the World Tree demonstrates that connection among levels cannot be understood without transition. Root, trunk and crown differ, but there is no void between them. Matter, energy, growth, form and time move among them. Within culture, this movement may be expressed as ascent, descent, transmission, initiation, genealogical continuity, spiritual connection or cosmic order. Morphologically, it is expressed as flow and development. The tree therefore provides a more complex model than the simple division of the world into three levels. It demonstrates not only structure, but also the process that sustains that structure.

The crown as a region of propagation is especially significant within this model. The propagation of form does not mean the loss of the centre. The branches diverge, yet remain connected with the trunk. The leaves multiply, yet belong to the tree. The fruits separate, yet carry the seed of the same form. This allows the tree to be considered a model of unity within multiplicity. Culturally, this may express the relationship between lineage and individuals, the world and its levels, a divine principle and its manifestations, knowledge and its branches, or tradition and its variants. The World Tree demonstrates that multiplicity does not necessarily destroy unity; it may be the means through which unity opens.

This proposition has direct significance to the hypothesis of the Unified Matrix of the Universe. If the Matrix manifests itself within different forms, the differences among those forms should not be regarded as a refutation of unity. On the contrary, the tree demonstrates that unity may manifest itself through numerous branches. Every branch differs, yet all remain connected with a common foundation. Morphological invariants may likewise manifest themselves within different biological, geological, cosmic and cultural forms without becoming identical. The World Tree provides an image of such differentiated wholeness.

Root, trunk and crown also make it possible to understand the relationship between internal and external in another way. The root lies within the earth and is concealed from view. The trunk is external, yet contains internal layers and flows. The crown is maximally open, yet its leaves also possess internal structures. The fruit is externally visible, but contains a seed within. The seed once again conceals the future form. The tree therefore continually translates the internal into the external and the external back into the internal. This is one of the deep cycles of morphogenesis. Form does not open only once; it passes repeatedly through states of concealment and manifestation.

Within the cultural image of the World Tree, this may correspond to secret knowledge becoming explicit; ancestors continuing through descendants; an invisible foundation manifesting itself within the world; a spiritual source producing the fruits of life; or death passing into rebirth. For the purposes of the present study, however, what matters primarily is the morphological core: concealed foundation—manifested axis—propagating form—fruit—new concealed foundation. It is this cycle that makes the tree one of the most complete models of connection among levels.

Thus, the tree as a model of connection among levels demonstrates that form possesses depth, verticality and propagation. The root represents the concealed region of nourishment, memory and potentiality. The trunk represents the manifested axis, channel and stable body of form. The crown represents the region of opening, multiplicity and interaction with the environment. Fruit and seed return the open form to a new beginning. Flows, transitions and interdependence exist

among these levels. The World Tree is therefore not only a symbol of life, but also a cultural model of multilevel morphogenesis.

This is its particular significance to the hypothesis of the Unified Matrix of the Universe. It demonstrates that universal form may be understood not as a flat sign, but as a vertically unfolded system. Here, the Matrix manifests itself as the connection between concealed and manifested, foundation and propagation, unity and multiplicity, memory and future, root and fruit. The World Tree makes this connection visible and culturally expressive. It is therefore not an arbitrary symbol among many others, but one of the most profound images through which human beings have represented the very principle of transition among levels of being and form.

19.5. The World Tree and the Unified Matrix

The World Tree occupies a special place within the hypothesis of the Unified Matrix of the Universe because it unites within a single image almost all the principal morphogenetic features examined in the preceding chapters: centre, axis, concealed foundation, opening, branching, levels, self-similarity, fruit, seed, cycle and the connection between the internal and the external. Unlike individual symbols, which express only one aspect of form, the tree presents an integral model of becoming. The circle shows closure and centre. The wave shows movement. The zigzag shows tension. The spiral shows unfolding and return. The flower shows opening. The seed shows potentiality. The tree, however, unites these motifs within a single living structure: it emerges from a seed, takes root, rises along an axis, branches, produces leaves, flowers and fruit, and returns once again to the seed.

It is for this reason that the World Tree may be regarded as a culturally recorded image of a morphogenetic algorithm. The word ‘algorithm’ should not be understood here in a narrow technical sense. This does not imply a mathematical programme supposedly known to ancient cultures and consciously encoded in their myths. Rather, it refers to a recurring sequence of form-generating operations: concealed foundation—vertical axis—branching—manifested multiplicity—fruit—new seed. This sequence can be observed in the tree itself as a natural organism and is subsequently transferred by culture to models of the world, lineage, time, memory, knowledge and the connection among levels. In this sense, the World Tree is not proof of the Matrix in the scientific sense, but one of the most powerful cultural images of its possible morphological logic.

The paramount significance of the World Tree lies in the fact that it presents form as a process. It is not a static symbol. Even when a tree is depicted motionlessly upon an artefact, its meaning remains connected with growth. It always implies movement from seed to trunk, from trunk to crown, from crown to fruit, and from fruit to a new seed. This processuality makes the tree particularly close to the general logic of the present study. The Unified Matrix of the Universe should not be understood as an immobile geometrical template. It may be conceived more appropriately as a system of stable operations through which form becomes visible: closure, germination, axial direction, branching, opening, fruiting and the return to a new potentiality.

In this respect, the World Tree unites natural and cultural morphology. As a natural object, the tree genuinely demonstrates growth, fractality, levels, internal flows, a root foundation and a crown. As a cultural image, it transforms these features into a model of the world. Human beings observe the tree in nature and then use it to conceive the cosmos, lineage, ancestors, life, death,

rebirth, knowledge, power, ritual, celestial order and the connection among worlds. The World Tree therefore stands at the boundary between biology and symbolism. It not only represents a plant, but also demonstrates how a natural form becomes a cultural language.

It is precisely this boundary that makes it especially important to the hypothesis. If the World Tree were only a myth, it would belong exclusively to the history of religions and symbols. If it were only a plant, it would belong to botany and biological morphogenesis. In cultural reality, however, it is both: the natural form of the tree becomes a model of the world. This means that human culture does not invent form arbitrarily, but frequently proceeds from structures already present in nature. Culture does not copy them literally; it intensifies, generalises and symbolises them, transferring them to broader levels of meaning.

The structure 'seed—tree—fruit—seed' is especially important to the Unified Matrix of the Universe. It demonstrates that form exists not only in space, but also in time. The seed is a closed potential form. The root is the concealed foundation of growth. The trunk is the manifested axis. The branches constitute the propagation of form. The crown is manifested multiplicity. Flowers and fruits represent a stage of completion and transition. New seeds signify a return to the beginning, but only after the entire cycle has been traversed. This sequence is remarkably close to the general A–B–C–D model, which has been used throughout different sections of this study to describe the transition from a concealed or closed form to a manifested one and thence to a new cycle.

Stage A in this model corresponds to the seed or concealed potentiality. The form has not yet been manifested within the seed, but is already contained within it as a possibility. Stage B corresponds to germination and the emergence of an axis: the shoot breaks through the shell, the root descends and the stem reaches upwards. Stage C corresponds to the fully developed tree: trunk, branches, leaves, crown, levels and self-similarity. Stage D corresponds to fruiting and the formation of a new seed. In the tree, however, stage D is not the end. It returns the process to a new stage A. The tree therefore demonstrates the cyclical nature of morphogenesis with particular clarity: the completion of one form becomes the beginning of another.

This cyclicity has immense philosophical significance. It shows that form does not simply arise and disappear. It transmits an algorithm. The seed does not contain a complete tree in visible form, but it contains the possibility of a tree. The fruit is not merely the result of growth, because a new beginning is already enclosed within it. The tree as a whole is not a closed individual object; it is incorporated into a chain of repetitions. The World Tree may therefore be read as an image of the continuity of form. In culture, this continuity readily becomes an image of lineage, generations, world ages, spiritual knowledge, tradition or cosmic renewal.

If the World Tree is considered through the fundamental invariants of the Matrix, the first of these is the centre. The centre of the tree is not always expressed as a point. It is instead a zone of transition between root and trunk, concealed and manifested, earth and verticality. Within the symbolic model, this centre may become the centre of the world, a place of birth, a place of sacrifice, a sacred domain or a point connecting different levels. The centre of the tree is not isolated; it immediately produces an axis. Centre and verticality are therefore inseparable within the World Tree. The centre does not remain motionless, but begins to grow.

The second invariant is the axis. The trunk of the World Tree is not merely a vertical line. It is a living axis, a conducting channel, a support, a memory of growth and a path among levels. In cultural systems, this axis becomes an image of the connection between the lower, middle and upper worlds. Within the hypothesis of the Matrix, the tree's axis demonstrates that form requires

direction. Without an axis, growth would be dispersed. Through the axis, concealed potentiality acquires a path towards manifestation. The axis gathers the form while simultaneously preparing it for branching.

The third invariant is branching. Branches demonstrate the transition from the one to the many. This transition is one of the key moments of morphogenesis. Form does not merely increase in size; it becomes differentiated. Large branches emerge from the trunk, smaller branches from them, followed by shoots, leaves, flowers and fruit. The same principle is repeated at every level: a local axis generates new directions. The tree is therefore a culturally intelligible model of self-similar growth. It demonstrates how a single structure may become multiple without losing its connection with its foundation.

The fourth invariant is the level. The World Tree almost always implies stratification: lower, middle and upper; root, trunk and crown; subterranean, terrestrial and celestial; past, present and future; ancestors, the living and descendants. The levels of the tree, however, are not separated. They are connected by flows. The root nourishes the trunk and crown. The leaves nourish the tree through light. The fruit returns the form to the seed. The tree therefore shows not merely a multiplicity of levels, but an interconnected multiplicity. This is particularly important to the understanding of the Matrix as a system of transitions rather than a collection of separate layers.

The fifth invariant is self-similarity. The tree repeats its structure within its branches, shoots, leaves, roots and venation. The part carries the principle of the whole without being its exact copy. This is an important qualification. The Matrix should not be understood as the mechanical repetition of an identical form. It manifests itself as a repetition of relationships: axis—lateral branches, centre—periphery, concealed—manifested, layer—new layer, fruit—seed. These relationships are expressed with particular clarity within the tree. The tree may therefore be called a living model of natural self-similarity.

The sixth invariant is the boundary. A tree has many boundaries: the seed coat, the surface of the root, the bark of the trunk, the edge of the leaf, the perimeter of the crown and the skin of the fruit. Each boundary is an active zone. The seed coat protects the potential form. The bark protects the trunk and records the traces of time. The leaf surface interacts with light and air. The crown creates a complex boundary between the tree and its environment. The fruit's outer layer protects the seed and participates in its dispersal. Through the tree, it becomes possible to see that a boundary is not the passive termination of form. It is a domain of transition, protection, exchange and further propagation.

The seventh invariant is opening. The tree does not open at a single moment, as a flower does, but over an extended period and through repeated events. The seed germinates, buds open, leaves unfold, flowers blossom, fruits ripen and seeds are released. Opening occurs at different scales and during different phases. In this respect, the tree is a more complex model of opening than an individual flower. The flower demonstrates one vivid moment of opening; the tree demonstrates a system of openings incorporated into an extended cycle of growth. The World Tree may therefore be regarded as an image not of a single morphogenesis, but of repeated morphogenesis.

These invariants make the World Tree particularly close to the concept of the Unified Matrix. It does not merely contain a single feature, but unites many features within an integral system. It contains concealed and manifested form, verticality and branching, boundary and flow, centre and periphery, levels and transitions, self-similarity and cycle. This is precisely why the tree has proved to be such a persistent cultural image. It is useful for thought not because it happened by

chance to become a symbol, but because its natural morphology genuinely enables it to express the complex structure of the world.

Methodological caution must nevertheless be maintained. The World Tree does not prove that all cultures possessed the same conception of the Matrix. It does not demonstrate that ancient peoples had a modern theory of fractality or morphogenesis. Nor does it prove that all tree myths originated from a single source. Its significance is different: it demonstrates that the tree as a natural form proved universally suitable for symbolising growth, the connection among levels and order. Within the present study, this makes it possible to describe the World Tree as a culturally recorded image of a morphogenetic algorithm, but not as direct scientific proof of a universal law.

The expression ‘the World Tree and the Unified Matrix’ should therefore be understood not as an assertion of complete identity, but as a relationship of correspondence. The World Tree corresponds to the Matrix in its structure: it demonstrates the features that the hypothesis regards as fundamental to the generation of form. It corresponds to the Matrix in its processuality: it shows the transition from the concealed to the manifested, from the one to the many, and from growth to fruiting and a new seed. It corresponds to the Matrix in its organisation into levels: it connects the lower, middle and upper domains. It corresponds to the Matrix through self-similarity: it repeats the principle of branching at different scales. This correspondence, however, remains cultural and morphological rather than constituting physical or mathematical proof.

Such an understanding allows both excessive scepticism and excessive assertion to be avoided. Scepticism might claim that the World Tree is merely a mythological symbol bearing no relationship to the structure of nature. This would be an oversimplification, because the symbol itself arose from the observation of a real tree, and trees genuinely exhibit powerful morphogenetic features. An excessive assertion might claim that the World Tree directly proves the existence of a universal Matrix known to ancient cultures. This would likewise be an oversimplification. The more accurate position is that the World Tree is a cultural image that records the naturally observable logic of growth with exceptional expressiveness.

The connection between root and fruit is especially important within this logic. At first sight, root and fruit are situated at opposite ends of the tree: the root below and the fruit within the crown. The fruit, however, contains a seed, and the seed may produce a new root. The upper therefore returns to the lower. Manifested form returns to concealed form. Multiplicity returns to potential unity. This loop makes the tree a cyclical model. It does not involve a simple movement from below to above. Rather, there is a circulation of form: seed — root — trunk — branches — fruit — seed. Culturally, this may be associated with ideas of life, death, rebirth, lineage, tradition and cosmic renewal. Morphologically, it is a model of a self-reproducing algorithm.

It is precisely this cyclical structure that brings the World Tree close to the general logic of the Matrix. The Matrix is conceived within this book not only as a spatial organisation, but also as a recurring path of form. Form arises, opens, becomes more complex, reaches the stage of fruiting and returns to a new potentiality. The tree demonstrates this path visibly. It requires no complex abstraction: every person can observe how a tree grows, bears fruit and produces seeds. It therefore becomes a natural cultural bridge between observation and philosophy.

It is also important that the tree unites individuality and universality. Every tree is unique: its form depends upon its species, location, light, soil, wind, age, damage and climate. Yet the general algorithm of the tree remains recognisable. The same may be said of cultural images of the World Tree. Yggdrasil, the *aśvattha*, the ceiba, the sacred tree of Western Asia, the biblical Tree of Life and the shamanic tree of ascent are all different. Yet the general morphological principle of the

tree remains recognisable: root, axis, branches, levels, connection among worlds, growth and fruit. This relationship between difference and recurrence constitutes an important argument in favour of the morphological approach. Universality manifests itself not through sameness, but through the recurrence of a structural logic within cultural diversity.

This relationship is especially important to the scientific seriousness of the hypothesis. If all cultural images were declared identical, such a claim would invite justified criticism. If their differences are acknowledged and recurring morphological features are then identified, however, the analysis becomes more precise. The World Tree does not eliminate cultural differences, but makes it possible to compare them at the level of form. One tradition may emphasise the connection among worlds; another, the fruit of immortality; a third, the ancestors; a fourth, the cosmic centre; and a fifth, ritual ascent. Yet in every case the tree remains a model of vertical growth and branching. It is precisely this recurrence that matters to the hypothesis.

The World Tree also enables the cultural-symbolic level of the Matrix to be connected with the preceding natural levels. Within the biological block, the tree and its parts belong to real processes of growth. Within the geological block, branching may be compared with valleys, river networks, cracks and folds. Within the cosmic block, branching and filamentary structures may be compared with distributed forms of matter. In the chapter on the artefact, the tree had already appeared as a possible axial scheme. The World Tree now unites these lines: it demonstrates how the natural morphology of branching becomes a cultural model of the cosmos.

It is particularly important that the World Tree translates a biological image into a metaphysical structure without becoming completely detached from biology. It remains a tree, yet becomes the world. It remains a plant, yet becomes an axis. It remains a living organism, yet becomes a model of levels. This is not an arbitrary act of symbolisation. The tree genuinely possesses a morphology that allows it to be read as a world. Culture does not therefore arbitrarily designate the tree as a cosmos; it reveals within the tree the very features that make it suitable for cosmological thought.

In this sense, the World Tree exemplifies how the Matrix may manifest itself in human perception. If a natural form possesses a high degree of structural expressiveness, human beings identify and intensify it, transferring it into myth, ornament, ritual, architecture, genealogy and philosophy. Form thereby becomes symbol. The symbol, in turn, begins to live within culture and to organise the human understanding of the world. The World Tree is therefore not only an object of interpretation, but also an instrument of thought. Through it, culture conceives growth, origin, connection, levels and return.

The World Tree may be described as one of the earliest forms of systemic thought. It represents a system not through an abstract scheme, but through a living image. It contains elements, levels, connections, flows, boundaries, cycles, return transitions, centres, branches and new beginnings. Modern language might speak of a complex system, hierarchy, network, self-similarity, exchange and cycle. Ancient culture spoke of the tree. These languages must not, of course, be equated. They nevertheless possess a structural comparability. It is this that makes the World Tree so valuable to the hypothesis of the Unified Matrix of the Universe.

The World Tree also demonstrates that the connection among levels may be not only mechanical, but organic. A mechanical connection joins parts externally. An organic connection means that the parts exist through and for the whole. Root, trunk and crown are not merely connected; they are mutually necessary. Branches are not additions to the trunk; they manifest its growth. Fruit is not an ornament; it completes and continues the cycle. The seed is not a remnant; it carries the

future form. In this respect, the tree is a model of organic wholeness. This is important to the hypothesis of the Matrix: universal form should be conceived not as an artificially assembled mechanism, but as a coherent system of becoming.

In cultural symbolism, this organic unity is frequently expressed through the idea of life. The World Tree is almost invariably connected with life, even though its specific meanings differ. It may be the Tree of Life, Tree of Immortality, World Tree, family tree, Tree of Knowledge or tree of ascent. In every case, it expresses not merely existence, but a living connection. Life is understood here not only biologically, but also structurally: as the ability of form to preserve itself, develop, branch, bear fruit and transmit its beginning onwards. This understanding is close to the morphogenetic logic of the Matrix.

It should nevertheless be emphasised that the World Tree does not invalidate other models of the Matrix. It is not the sole universal image. The book has already examined the flower, leaf, seed, stone, relief, nebula, galaxy, artefact, wave, spiral and zigzag. Each of these images reveals a particular aspect of form. The World Tree is especially powerful in relation to growth, axis, levels and branching. It does not, however, encompass the entire Matrix. Rather, it is one of the most comprehensive cultural syntheses in which many invariants are united within an accessible and enduring form.

The chapter's conclusion must therefore be formulated with care and precision. The World Tree may be regarded as a culturally recorded image of a morphogenetic algorithm. It demonstrates how a single beginning becomes an axis, the axis becomes branches, the branches become multiplicity, multiplicity becomes fruit, and fruit becomes a new seed. It connects the concealed, the manifested and the propagating. It unites root, trunk, crown, levels and self-similarity. It is present in different cultures not because all myths are identical, but because the form of the tree itself constitutes an exceptionally powerful model of growth and connection.

Herein lies its significance to the Unified Matrix of the Universe. If the Matrix is a hypothetical system of universal invariants of form, the World Tree is one of its cultural images most readily comprehensible to human beings. It translates the complex idea of morphogenesis into an image that can be seen, experienced and transmitted. Within the tree, the Matrix becomes not an abstract scheme, but a living verticality: the root descends into concealed depth, the trunk raises form into manifested space, the branches propagate it into multiplicity, the fruit returns it to the seed, and the seed once again preserves future growth. It is this sequence that makes the World Tree a universal model of growth and one of the central symbols of the cultural-symbolic level of the Matrix.

Thus, the World Tree should not be regarded solely as a religious or mythological motif. It is a multilayered cultural form in which the natural morphology of the tree, the human experience of growth, the symbolism of levels and the philosophical idea of becoming are united within a single structure. It may be studied as a myth, symbol, artefactual motif, genealogical model or cosmological image. Within the present study, however, its morphological reading is especially important: the World Tree records the algorithm of transition from the concealed to the manifested, from the one to the many, and from growth to fruiting and a new beginning.

It is for this reason that the World Tree becomes one of the principal confirmations of the cultural significance of the hypothesis. It does not prove the Matrix in the strict scientific sense, but it demonstrates that, over thousands of years, human culture has intuitively identified and preserved an image remarkably close to morphogenetic logic. If natural forms demonstrate invariants within matter, the World Tree demonstrates them within symbolic consciousness.

There is no direct identity between these levels, but there is a profound structural resonance. It is within this resonance that the significance of the World Tree to the Unified Matrix of the Universe resides.

Fig. 1. Morphological Scheme of the World Tree: Root, Trunk, Branches, Levels, Central Axis, and Self-Similar Propagation of Form

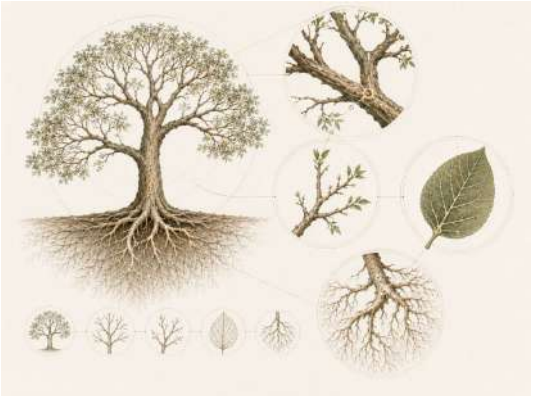

Fig. 2. Fractality of the Tree: Repetition of Axis and Branching across Different Scales — from Trunk and Crown to Branch, Shoot, Leaf, and Root System

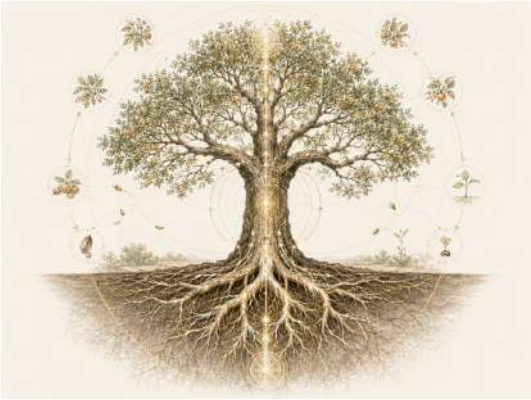

Fig. 3. The World Tree as a Model Linking Different Levels: Root as the Hidden Foundation, Trunk as the Manifest Axis, Crown as the Expanding Form, and Fruit and Seed as the Return of the Cycle

Chapter Twenty

Sumerian Bas-Reliefs and the Process of the Opening of the Grain

20.1. The Bas-Relief as a Visual Code

A Sumerian bas-relief, considered within the context of the hypothesis of the Unified Matrix of the Universe, should not be understood as a simple illustration of a pre-existing idea. It is not direct proof of a morphogenetic scheme, nor is it a scientific diagram in the modern sense, and it cannot be detached from its archaeological, religious, social and artistic context. At the same time, however, the bas-relief may be regarded as a distinctive type of visual code in which individual compositional elements—figures, objects, signs, gestures, axes, circles, star-shaped forms, waves, plants, vessels, lines and symmetrical arrangements—create not only an image, but also a sequence of relationships. It is precisely this sequence that makes the bas-relief important material for cultural-morphological analysis.

In this context, a visual code should be understood not as a secret cipher or concealed esoteric system, but as a stable mode of organising an image. The ancient bas-relief was created within a culture in which imagery was closely connected with ritual, power, myth, economic life, sacred order and communal memory. Its elements are not accidental. They are arranged in a particular manner and possess a relative scale, direction and position within the composition, a connection with a central figure or object, and a relationship with the upper and lower zones, the right and left sides, and the line of action or ritual gesture. The bas-relief may therefore be read not only as a collection of figures, but also as a structure.

Such a reading requires caution. It is impossible to declare arbitrarily that every sign is an element of morphogenesis. Nor can it be claimed that the Sumerian craftsman consciously represented the process of the opening of the grain in terms resembling the modern language of morphology. Modern concepts cannot be projected onto an ancient monument without qualification. It is nevertheless possible to ask whether the composition of the bas-relief permits an additional morphological reading. Can the arrangement of its elements be understood as a sequence marking the transition from a closed form to an opened one? Does it contain an axis along which movement is organised? Can signs of potentiality, transition, opening, fertility, water, vegetation and reproduction be identified within it? If such features are present, they may be considered as elements of a visual process.

This chapter examines the Sumerian bas-relief precisely at this additional level. Its religious and historical-cultural meaning is not denied. On the contrary, it must be acknowledged as primary. The bas-relief belongs to a specific civilisation, a particular artistic tradition and a particular mode of representing sacred and social order. Within the hypothesis of the Matrix, however, we are interested not only in whom or what it depicts, but also in how it organises form. Form here becomes a means of preserving a process. If a composition includes a central axis, signs of a celestial or vegetal order, circles, crescents, stars, undulating elements, vessels, water or plants, it may be read as a system of transitions among states.

Sumerian culture is especially important to such an analysis because it belongs to one of the earliest civilisational complexes in which image, sign, the agricultural cycle, cult, power and cosmological representation were closely interconnected. Agriculture, water, grain, irrigation, fertility, the heavens, deities, ritual and urban order constituted a single semantic environment. Vegetal and aquatic motifs in the art of ancient Mesopotamia cannot therefore be regarded as mere decoration. They were connected with the life of society, food, the harvest cycle, rivers, canals, land, power and sacred prosperity. This makes it possible to undertake a cautious morphological reading of the bas-relief through the process of the grain: closure, opening, germination, nourishment, growth and reproduction.

The word ‘grain’ should nevertheless be understood in two ways within this chapter. On the one hand, it may refer to the actual agricultural experience of an ancient culture: grain as food, seed, harvest, a vital resource and the foundation of economic order. On the other hand, the grain acts as a morphological model: a closed potential form that contains future growth. In this model, the grain is close to the seed, but it also possesses its own cultural significance. It is connected not only with botany, but also with human labour, the field, water, storage, sowing, sacrifice, the annual cycle and the survival of society. The process of the opening of the grain is therefore simultaneously natural, economic and symbolic.

The bas-relief as a visual code may record this process not literally, but through a system of signs. The circle may be read as a closed form, seed, grain, centre or potential wholeness. The crescent may be regarded as a transitional form, an opening of the shell or a phase between closure and complete manifestation. The star-shaped form may be interpreted as an opened, radially expanding structure or as a state of manifestation. A staff or vertical line may be read as the axis along which the process unfolds. Water and plants may designate environment, nourishment, germination and further reproduction. All these readings require qualification, but as a morphological sequence they form an important line of enquiry.

It is here that the idea of the bas-relief as a process arrested within an image arises. The bas-relief does not move, but it may show movement through the arrangement of its elements. It may not depict grain at a literal botanical stage, but it may unite signs in such a way that they form a logic of transition: closure—opening—radial propagation—incorporation into the environment—growth—fertility. This approach is close to the way in which the artefact was regarded as an ‘opened bud’ in the preceding chapter. An internal cultural scheme is brought to the surface of the object. In the bas-relief, this surface acquires relief and depth: the sign is not merely drawn, but carved, raised above the background and transformed into material form.

A bas-relief differs from a flat image in that it combines surface and volume. Its figures project from stone or another material without becoming completely detached from their foundation. This is especially important morphologically. The bas-relief appears to exist between the concealed and the manifested: the image remains connected with the plane of its foundation, yet already emerges from it. In this sense, bas-relief as a technique may itself be understood as a metaphor for the manifestation of form. The image is not fully separated from matter, yet it has already become visible relief. It emerges from the surface just as a sign emerges from an internal cultural order. The bas-relief is therefore particularly suitable for analysing the transition from the concealed to the manifested.

In this context, the Sumerian bas-relief may be regarded as a multilayered system. The first layer is material: stone, clay, gypsum, metal or another medium, the relief technique, traces of the craftsman’s hand, the depth of the carving and its state of preservation. The second layer is

iconographic: figures, objects and signs, and their presumed connection with a particular scene, ritual, deity, royal subject or cultic theme. The third layer is compositional: centre, axis, symmetry, the arrangement of elements, the direction of gestures, verticality, horizontality, registers and the relationship between the upper and lower zones. The fourth layer is morphological: a possible sequence of form-generating states. The fifth layer is philosophical and hypothetical: the connection between this sequence, the A–B–C–D model and the general hypothesis of the Matrix. These layers must be distinguished.

If they are not distinguished, the analysis becomes arbitrary. For example, if a star-shaped form appears on a bas-relief, it might immediately be declared the ‘complete opening of the grain’. Such a conclusion would be excessively hasty. Its possible cultural meaning must first be acknowledged: the star may be a celestial sign, an emblem of a deity, an astral symbol, a decorative motif or an element of a specific iconography. Only then may a morphological question be posed: irrespective of its particular symbolic meaning, what structure does it demonstrate? It has a centre and rays; it displays radial propagation; it differs from the closed circle; it may be compared with a phase of opening. Such a reading does not negate the cultural meaning, but adds a structural level to it.

The same applies to the circle. A circle may be a disc, seal, celestial sign, vessel, fruit, grain, centre, eye, sun, moon or purely geometrical form. Within this chapter, it may be regarded as a model of a closed seed only if the compositional sequence supports such a reading. If transitional forms, an axis, vegetal motifs, water or signs of growth are present nearby, the circle may be incorporated into a morphogenetic sequence. If no such connections exist, this interpretation must remain weak or be rejected altogether. The bas-relief as a visual code therefore requires not a single sign, but a system of signs.

The system of signs is more important than its individual elements. A single circle does not yet create a process. A single staff is not yet an axis of morphogenesis. A single zigzag does not prove movement. If, however, the elements are arranged in such a way that a sequence arises among them, analysis becomes possible. For example, if a vertical staff stands at the centre of the composition; if a circle, crescent and star-shaped form are positioned along or beside it; and if other elements indicate water, vegetation or reproduction, the entire scene may be read as a visual model of transition. In this case, the bas-relief becomes not merely an image of individual symbols, but a structure of process.

The central axis of the composition is of particular significance. In ancient artefacts, the axis frequently organises the image: figures, symmetrical elements, ritual objects, plants and celestial signs are arranged around it. A central staff or vertical object within a Sumerian bas-relief may be read not only as an attribute of power, a deity or ritual action, but also as a morphological line. It establishes a direction along which the stages of opening may be arranged. Such an interpretation should not displace the iconographic meaning of the staff. It does, however, make it possible to recognise its structural function: the staff unifies the composition, establishes its verticality and transforms separate signs into a sequence.

In this respect, the bas-relief may be compared with the World Tree examined in the preceding chapter. The tree organises levels through its root, trunk and branches. The staff or vertical axis of the bas-relief may perform an analogous compositional function, but in a more abstract and cultural-ritual form. If the tree is a living axis of growth, the staff may be an axis of symbolic order. It does not grow, but it organises. It does not branch, but signs representing different stages may be arranged around it. It does not nourish the form biologically, but it unifies it visually. The staff

as an axis of morphogenesis will therefore form the subject of the following section of this chapter.

The bas-relief as a visual code may also record the relationship between upper and lower levels. Celestial signs—a circle, crescent, star or divine symbols—may be situated in the upper zone. Water, plants, vessels, animals, human beings and terrestrial elements may appear in the lower zone. Between them may stand a figure, staff, plant or central object. This vertical organisation makes it possible to regard the bas-relief as a model connecting the celestial, terrestrial and vegetal domains. Once again, however, this does not mean that every such composition is automatically a scheme of the Matrix. The particular arrangement of elements, their cultural function and the degree of their structural coherence must be analysed.

The idea of transition is especially important to a morphological reading. The hypothesis of the Unified Matrix of the Universe is based not only upon the similarity of forms, but also upon transitions among states. A closed form opens. An axis produces branching. A layer becomes an edge. A seed becomes a shoot. A bud becomes a flower. An artefact brings an internal image to the surface. In the bas-relief, the process of the opening of the grain may be represented through signs that do not necessarily depict real grain but nevertheless demonstrate a sequence: closed wholeness, partial opening, complete radial manifestation, entry into an environment and further growth. It is precisely such a sequence that connects the Sumerian material with the principal scheme of the study.

If the circle is interpreted as a closed seed, it corresponds to the stage of potentiality. It is whole, enclosed and undivided, and possesses a centre and boundary. If the crescent is interpreted as a transitional phase, it demonstrates the disruption of complete closure, the opening of form, asymmetry and the beginning of manifestation. If the star-shaped form is interpreted as complete opening, it demonstrates radial propagation, emergence from the centre and manifestation. Water and plants appearing in another bas-relief or related material may be read as the environment within which the opened form continues its life: the grain enters earth and water, germinates, produces a stem, leaves, fruit and new seeds. Within this sequence, the bas-reliefs begin to function as a visual narrative of morphogenesis.

It must nevertheless be emphasised that this is not a reconstruction of the ancient craftsman's intentions, but the author's morphological interpretation. It is valid only as an additional level of reading. It must not conflict with archaeological and iconographic evidence. If a particular sign within Sumerian material has an established meaning, that meaning must be acknowledged. Morphological analysis may ask what form the sign demonstrates and how it functions within the composition, but it must not arbitrarily replace its established meaning with another. It is precisely this distinction that makes the interpretation scientifically cautious.

The bas-relief as a visual code may also be understood as a distinctive form of memory. It preserves not only a scene, but also the order in which elements are arranged. Unlike a text, which unfolds sequentially through time, a bas-relief presents everything simultaneously. The viewer's gaze, however, may travel across it: from centre to periphery, from lower to upper, from one sign to another, along the staff, around the circle, from water to plant and from figure to symbol. The bas-relief therefore contains a concealed sequence of reading. It is spatial, yet may also be processual. This characteristic makes it possible to regard it as the visual code of a process.

In this respect, the Sumerian bas-relief approaches the artefact as an 'opened bud'. The surface of the bas-relief is already a manifested cultural form. Within this manifested form, however, there may be signs of another opening—the opening of the grain, plant, life cycle or fertility. A dual

structure therefore emerges: culture manifests its internal image upon the surface of an artefact, while the image itself may narrate the opening of a natural form. This makes the bas-relief especially complex and significant. It does not merely record symbols; it may record a process in which those symbols are organised as stages.

Several parameters must be considered when analysing such a process. The first parameter is the position of the sign: where are the circle, crescent, star, staff, plant and water situated? The second is direction: is there verticality, upward or downward movement, lateral movement or radial propagation? The third is connection: are the elements positioned beside one another, along an axis, sequentially, symmetrically or separately? The fourth is form: closed, open, radial, undulating, vegetal or axial? The fifth is the element's function within the composition: central, secondary, peripheral, framing or connecting? Only through such an analysis is it possible to speak of the bas-relief as a visual code rather than as a collection of free associations.

The material of the bas-relief is also important. Relief creates an interplay of light and shadow, projection and indentation, background and figure. This is not merely a technical detail. Morphologically, chiaroscuro intensifies the distinction between the manifested and the concealed. Projecting elements become visible, recessed elements remain in shadow, and the contour separates the form from its background. The bas-relief demonstrates the very process by which form is differentiated from matter. In this respect, it becomes an appropriate medium for the theme of opening. The sign literally emerges from the plane, just as form emerges from a potential state. This parallel should not be exaggerated, but it helps to explain why the relief artefact possesses such distinctive expressiveness.

Viewed within the wider perspective of this chapter, the Sumerian bas-relief may be understood as the first stage of a cultural-morphological analysis of specific ancient material. Chapter 18 formulated a general methodology for the artefact. Chapter 19 examined the universal image of the World Tree. Attention now shifts towards a more specific composition in which individual signs may be connected with the process of the opening of the grain. This makes the analysis both riskier and more concrete. The risk lies in the possibility of overinterpretation. Its concreteness lies in the fact that we are no longer discussing the tree in general, but considering particular visual elements: the staff, circle, crescent, star, water and plants.

This chapter therefore consistently maintains two levels of language:

1. The cautiously descriptive level: the bas-relief contains particular compositional elements that may be described as axial, closed, transitional, radial, undulating or vegetal.
2. The hypothetical-morphological level: these elements may be interpreted as stages in the process of the opening of the grain and incorporated into the A–B–C–D model.

These levels must not be confused. Description must be clear, interpretation must be explicitly identified as interpretation, and conclusions must remain cautious. Only then can the Sumerian material be incorporated into the study without weakening it methodologically.

The bas-relief as a visual code also raises the question of the relationship between image and time. The process of the grain unfolds through sowing, swelling, the opening of the shell, germination, rooting, stem growth, the appearance of leaves, flowering, fruiting, ripening, harvesting and the production of new grain. A bas-relief need not depict this entire process literally. It may, however, condense it into a symbolic sequence. Circle, crescent, star, water and plant may be read as a compressed visual narrative of the transition of form. This compression of

process is characteristic of culture: extended natural time is translated into a compact composition. In this sense, the bas-relief is not only an image, but also a scheme of time.

It is precisely such a scheme of time that is important to the A–B–C–D Matrix:

- stage A is closed potentiality;
- stage B is the beginning of opening;
- stage C is complete manifestation;
- stage D is transition into the environment and reproduction.

If a Sumerian bas-relief or group of bas-reliefs permits such a sequence to be constructed, it becomes a valuable example of the cultural recording of a morphogenetic cycle. Once again, however, this does not mean that the ancient bas-relief 'proves' the A–B–C–D scheme. It may be read through this scheme if its composition and signs provide grounds for doing so. The distinction between proof and interpretative applicability is fundamental.

A working definition may therefore be proposed within this context: a bas-relief as a visual code is a composition in which individual signs may be read not in isolation, but as elements of a structural process. Such a process may be mythological, ritual, social, cosmological or morphogenetic. The present chapter is concerned with the final aspect, but it does not negate the others. The bas-relief becomes important not because it contains a single 'correct' sign, but because its elements may be organised into a sequence: axis, closed form, transitional form, opened form, environment, growth and reproduction.

Such an understanding avoids superficial symbolism. We do not say that a circle always means a seed, a crescent always signifies opening, or a star always represents a flower or mature form. Rather, we say that, within a particular compositional logic, the circle may be regarded as a closed potential form, the crescent as a transitional phase and the star-shaped form as radial opening. The meaning of these elements depends upon their place within the system. It is the system that transforms a sign into a stage. This is an important methodological principle of the entire chapter.

The bas-relief as a visual code may be especially useful in explaining how an ancient culture conceived process not through analytical concepts, but through images. The modern researcher may describe morphogenesis through stages, invariants, axes, radiality, shell, fractality and self-similarity. An ancient culture might express comparable relationships through the staff, grain, water, plant, star, deities, gestures and ritual objects. These are different languages. They cannot be equated, but they may be compared at the level of form. Morphological analysis seeks precisely this level: not a direct coincidence of concepts, but the structural comparability of images and processes.

Thus, the Sumerian bas-relief is regarded as a visual code: a composition in which individual elements may be connected into a process. Within the author's interpretation presented here, this process corresponds to the opening of the grain: from a closed potential state to a transitional phase, thence to opening, and subsequently to entry into an environment, germination and reproduction. This reading nevertheless remains supplementary and morphological. It does not replace archaeological attribution, negate cultural context or claim to reconstruct conscious scientific knowledge among the ancient Sumerians. Its purpose is to demonstrate that an ancient bas-relief may be regarded as a materially fixed scheme of a process in which form, sign and morphogenesis are united within a single cultural image.

20.2. The Staff as an Axis of Morphogenesis

Within the composition of a Sumerian bas-relief, the central staff may be regarded not only as an object of power, ritual action or sacred status, but also as a morphological axis. Such a reading does not negate its historical-cultural significance. In ancient cultures, a staff, rod, sceptre, shaft, spear, stalk or other vertical object was frequently associated with power, mediation, ritual, law, divine sanction, directed action or the transmission of force. Within this chapter, however, we are interested in an additional level: how a vertical object organises the image and transforms separate signs into a sequence of process.

Above all, the staff establishes direction within the bas-relief. It gathers the viewer's gaze and creates a vertical line in relation to which the other elements of the composition may be read. If a circle, crescent, star, plant, water or figures are arranged around this vertical, they cease to be disconnected signs. They begin to be perceived as elements of a unified structure. The staff becomes a line connecting them. It does not necessarily depict growth itself, but it may perform the function of an axis along which growth, opening or transition acquires visual order. In this sense, the staff may be understood as a cultural analogue of a stalk, trunk or central vein: it is not living tissue, but it organises form in the manner in which a living axis organises a plant.

This approach is especially important to the hypothesis of the Unified Matrix of the Universe. In many natural forms, the axis is the primary condition of unfolding. A seed germinates through the emergence of a root and shoot. A bud opens around an internal axis. A flower possesses a centre and a direction of opening. A leaf is structured around its central vein. A tree rises through its trunk and branches from it. A valley organises a network of lateral channels. Even in geological and cosmic forms, it is possible to distinguish directions, lines of tension, axes of ejection, radial centres or elongated structures. At the cultural level, the staff appears as a humanly created axis around which a scheme of process may be organised.

In this respect, the staff differs from the circle, crescent or star. These signs may express a state of form: closure, transition, opening, radiality, completeness or a phase of manifestation. The staff, however, expresses not a state, but a direction. It establishes the structural path along which the different states may be arranged. If the circle is a potential form, the crescent a transitional form and the star an opened form, the staff may be the axis connecting these states into a sequence. Without an axis, they might remain separate symbols. With an axis, they may be read as stages of a single process.

Visually, the staff possesses several important features:

1. It is vertical or nearly vertical.
2. It is elongated and therefore possesses a beginning, direction and extension.
3. It is frequently held by a figure, positioned beside the central figure or situated within a compositionally significant zone.
4. It may be connected with the upper and lower levels of the image.
5. It may serve as a boundary between the right and left sides or as the centre of symmetry.

All these features make the staff not merely an object, but an organising element of the composition. It transforms the image into an axial structure.

If the staff is regarded as an axis of morphogenesis, it is important to understand that this does not imply a literal biological process. The staff does not grow, germinate, branch or produce grain. It may nevertheless record a principle without which morphogenesis is difficult to imagine: the principle of directed unfolding. Every form passing from a concealed state to a manifested one

requires direction. A seed does not open chaotically: its root descends and its shoot rises. A bud opens around an internal centre and axis. A tree grows vertically. Even when a form subsequently becomes branching or radial, its initial impulse is often connected with axial organisation. The staff within the bas-relief may be a cultural sign of this directionality.

Its connection with verticality is especially important. In ancient images, the vertical often conveys the meaning of a connection among levels. It may connect earth and heaven, the lower and upper domains, the human being and the deity, ritual action and cosmic order. Within a morphological reading, the vertical also connects the concealed and the manifested. If the lower level is associated with earth, water, grain, origin or potentiality, while the upper is associated with light, the star, a divine sign, opening or fruit, the staff may be read as a line of transition between them. It demonstrates that the process possesses a direction from foundation to manifestation, from the closed to the opened, from earth to sign, and from the potential to the manifested.

In this sense, the staff is close to the stalk of a plant. The stalk is the axis along which a plant rises from the earth and bears leaves, flowers, ears or fruit. It connects the root with the upper part of the plant. It conducts substances, supports the form and establishes the direction of growth. The staff within the bas-relief is not, of course, a stalk in the botanical sense. If signs of grain, vegetation, water or celestial order are arranged beside or around it, however, it may be read as a symbolically transformed axis of growth. The staff then becomes not merely an attribute, but a morphological mediator between the closed grain and the opened form.

This interpretation is especially productive when the staff occupies a central position. Its centrality intensifies its function. If the staff is displaced towards the edge of the composition, it may be merely an object held by a figure. If it stands at the centre or coincides with the axis of the entire scene, its significance becomes broader. It divides space, connects elements, balances the two sides and establishes a vertical hierarchy. The central staff transforms the bas-relief into an axial composition. It is precisely such a composition that allows it to be described as an axis of morphogenesis.

Several levels of meaning must nevertheless be taken into account. The staff may simultaneously function as a sign of power, ritual object, attribute of a deity, symbol of the transmission of force and morphological axis of the composition. These meanings do not necessarily exclude one another. Within an ancient image, a single element frequently operates at several levels at once. Modern analysis should not select only one meaning and reject all others. It is far more accurate to say that, within its historical-cultural context, the staff may possess an established symbolic function, while within an additional morphological reading it may be regarded as the axis along which the composition organises the process of opening.

The staff as an axis of morphogenesis is also connected with the concept of measure. An axis not only directs, but also orders. It makes it possible to relate elements according to height, distance, position and role. Signs within the bas-relief may be situated above or below the staff, closer to or farther from it, to its right or left, and near its summit, centre or base. This creates a spatial grammar. If the circle, crescent and star are positioned in relation to this axis, they may be read not only as separate symbols, but also as a sequence of states. In this sense, the staff performs the role of a coordinate line within the image.

This function may be compared with the central vein of a leaf. The central vein establishes direction within the leaf, lateral veins extend from it, and the form of the blade is distributed around it. In a valley system, the principal valley gathers lateral tributaries. In a tree, the trunk

connects roots and branches. In an artefact, the central axis organises the composition. The staff within a Sumerian bas-relief may be included within the same morphological sequence. It is not a natural axis, but a cultural one. It demonstrates that human beings transfer the principle of axial organisation into imagery.

It is especially important that the staff may be connected not only with verticality, but also with action. In a figure's hand, it becomes an extension of the gesture. It is directed, held, transferred, raised, brought into contact, used to indicate or employed to connect. The hand and staff form a system of action. If a figure holds the staff, that figure appears to control the axis, possess it, transmit force or order through it. From a morphological perspective, this is particularly interesting: the axis is not only a structure, but also an instrument. It does not merely exist within the composition, but participates in a ritual or symbolic action.

Within the author's interpretation of the process of the opening of the grain, this may be understood in the following way. Grain in itself is a closed potential form. For it to open, certain conditions are required: earth, water, warmth, time and a direction of growth. The staff as an axis may symbolically record the moment at which this process becomes ordered. It demonstrates that opening is not chaotic. It is directed. It possesses a path from the closed to the manifested. If a circle, crescent and star are arranged around the staff, the staff connects them as stages: the enclosed grain, the initial phase of opening and complete radial manifestation. If water and plants subsequently appear within the composition or in a second bas-relief, the staff becomes the initial axis of the entire morphogenetic chain.

This reading may be connected with the A–B–C–D model:

- stage A is the circle as closed potentiality;
- stage B is the crescent as the disruption of closure and the beginning of opening;
- stage C is the star-shaped form as complete opening, radiality and emergence from the centre;
- stage D is the transition of the opened form into the environment, water, vegetation and reproduction.

Within this system, the staff is not equivalent to any one of these stages. It is the axis along which the stages are connected. It establishes the order of transition and makes it possible to read the bas-relief as a process.

This point is fundamental. The staff is not the 'seed', 'shoot' or 'flower'. It is the structural condition of their sequence. It should therefore be understood not as an element of the process, but as the line of the process. It does not demonstrate an individual state of form, but preserves the connection among states. In this sense, it is closer to the concept of a morphogenetic channel. Through it, the composition acquires directionality and the possibility of transition. If the circle, crescent and star are phases, the staff is the axial path among those phases.

Such an interpretation must nevertheless remain cautious. In Sumerian art, staffs, rods, sceptres and other attributes may possess meanings of their own, connected with divine authority, royal legitimation, ritual or status. These meanings cannot be ignored in favour of the author's scheme. On the contrary, they must be taken into account. A morphological reading becomes permissible only when it acknowledges that the staff already possesses a cultural function. This function is not replaced; an additional compositional and structural aspect is considered. The staff may be both an attribute of power and an axis of the image. These levels may coexist.

In this sense, the staff as an axis of morphogenesis exemplifies the multilayered nature of the cultural sign:

- at the material level, it is a depicted object;
- at the iconographic level, it is an attribute of a figure or scene;
- at the compositional level, it is a vertical line organising space;
- at the morphological level, it is the axis of a process;
- at the philosophical level, it is a model of the connection between closed potentiality and opened form.

Each level adds meaning, but must not destroy the others. This multilayered nature makes the bas-relief a complex object of analysis.

The staff also helps illuminate the relationship between human action and natural process. Grain opens in nature, but within an agricultural culture this process is incorporated into human labour: sowing, irrigation, cultivation of the land, harvesting, storage and fertility rituals. The staff as an object of power or ritual may symbolically represent the intervention of order within the natural cycle. It does not create life by itself, but signifies governance, invocation, blessing, direction or the sanctioning of the process. In morphological terms, the staff connects the natural opening of the grain with the cultural order through which it is understood.

The agricultural foundation of Sumerian civilisation must therefore be given particular consideration. Water, canals, grain, fields, harvest and storage were not abstract symbols, but conditions upon which the existence of the city and society depended. A bas-relief containing axial, vegetal, aquatic or celestial elements may record not only a mythological subject, but also the connection among cosmic, social and agricultural order. The staff within such a composition may act as a line connecting these domains. It may indicate that the process of growth does not exist outside culture, but within a sacralised and ordered world.

From a morphological perspective, it is especially interesting that the staff may be straight while the process of the opening of the grain is nonlinear. The grain opens, the root descends, the shoot rises, leaves unfold laterally, and the ear or fruit develops as a complex structure. Why, then, is the axis straight? Because it establishes not the form of the entire process, but its directionality. Branching, opening and multiplicity may emerge only after a primary orientation has been established. The straight axis does not negate future complexity; it forms its foundation. The trunk of a tree is likewise relatively straight, even though its crown branches. The stalk of a cereal plant is also axial, although its ear contains many grains. The staff may therefore be understood as a sign of the primary vertical organisation from which multiplicity subsequently emerges.

Such an understanding makes it possible to connect the staff with the stalk of the cereal plant. As a grain germinates, it produces a root and shoot. The shoot rises, becomes a stalk, bears leaves and subsequently produces an ear. The ear, in turn, contains new grains. If the composition of the bas-relief genuinely permits a morphogenetic reading, the staff may be regarded as an abstracted axis of this vegetal process. It does not depict a particular stalk, but structurally corresponds to what the stalk does: it connects the lower foundation with upper fruiting. In this sense, the staff may be a cultural sign of directed growth.

The relationship between the staff, ear and grain must be formulated cautiously. It cannot be claimed that every staff within a Sumerian bas-relief represents a stalk of grain. Such a claim would be excessive. Within the specific authorial interpretation developed here, however, it is possible to say that the central staff may be compared with the axis of vegetal morphogenesis if

the composition as a whole supports an agricultural-morphological reading. In other words, the meaning of the staff is determined not only by its form, but also by its surroundings. If signs of fertility, water, vegetation or the celestial cycle appear around it, its axial function becomes more pronounced.

The staff may also be regarded as a boundary between symmetrical sides. If the composition is constructed as a mirror image, the staff divides it into left and right regions. It then becomes not only a vertical, but also the centre of equilibrium. This is important to the understanding of process. The opening of the grain may be represented as emergence from the centre towards the sides: the shell opens, the form divides, rays diverge and leaves unfold. In this case, the central axis preserves the symmetry of opening. Without it, the process might be represented as a chaotic rupture. With it, the process becomes an ordered unfolding.

This idea is especially important to the following section, in which the circle, crescent and star will be considered as stages of opening. The staff prepares the way for this reading. It shows where the line of the process runs. The circle may be positioned in relation to the axis as a closed whole. The crescent may be understood as partial opening in relation to the same axis. The star may be understood as radial opening, in which the axis has already expanded into a multiplicity of directions. The staff is therefore the condition for the transition from the linear to the radial. It demonstrates the initial vertical from which more complex forms may unfold.

The staff as an axis of morphogenesis also makes it possible to regard the difference between power and growth not as an opposition, but as a possible connection within ancient thought. In an agricultural civilisation, power is frequently connected with securing order, water, harvest, ritual, communication with the gods and the stability of the city. The growth of grain is not a private natural process; it is incorporated into a social and sacred order. An object of power may therefore simultaneously serve as a sign of the ordering of the life cycle. A morphological reading of the staff as the axis of a process does not negate its political or ritual significance, but demonstrates why such an object might occupy the centre of a composition connected with fertility and the opening of form.

The visual illustration for this section may be constructed as an analytical diagram of the central staff within the bas-relief (*Fig. 1*). It should not reproduce a specific archaeological monument as an exact reconstruction if its purpose is to explain the morphological principle. It would be preferable to present a generalised composition: a vertical staff at the centre, surrounded by conventional signs of a closed form, transitional form and opened radial form, with a suggestion of grain, water and growth below or nearby. It is important that the illustration should not appear to be a pseudo-historical reconstruction. It must be identified as an analytical diagram of the morphological reading: the staff as an axis around which the process of opening is arranged.

Such an illustration will allow the reader to understand that the claim is not that the Sumerian staff literally ‘depicts’ the morphogenesis of grain in the modern sense. The concern is its structural function. The staff demonstrates verticality, connection and direction. States of form may be arranged around it. It helps the composition to be read as a process. This is precisely what makes it important to the present chapter. Without an axis, the circle, crescent and star might remain separate signs. With an axis, they may be incorporated into the A–B–C–D model.

In a broader sense, the staff as an axis of morphogenesis continues the theme of the World Tree. In Chapter 19, the tree was examined as a living model of the connection among levels: root, trunk, branches, crown, fruit and seed. In the present chapter, the staff acts as a more abstract cultural axis. It possesses neither roots nor branches, but preserves the vertical principle. It

appears to isolate only the trunk from the tree, transforming the living axis into a sign. Other elements of the process—grain, opening, star, water and plant—may then be arranged around this sign. In this way, cultural form condenses a natural algorithm into a symbolic structure.

This condensation is an important characteristic of the artefact. Culture rarely transfers an entire natural process in full. It selects the principal elements and transforms them into signs. The tree may be reduced to a trunk or staff. The seed may be reduced to a circle. Transition may be reduced to a crescent. Opening may be reduced to a star. Water may be reduced to an undulating line. Growth may be reduced to a plant or shoot. The bas-relief as a visual code unites these condensed elements within a composition. Within such a system, the staff performs the role of the axis that holds the condensed signs together.

Thus, the staff as an axis of morphogenesis is the key to reading the Sumerian bas-relief within the present chapter. It makes it possible to proceed from separate symbols to a processual composition. It establishes the vertical, connects levels, organises the pictorial space, holds together the stages of opening and prepares their connection with the A–B–C–D model. Its historical-cultural significance must be preserved, but it may additionally be regarded as a morphological axis. It is in this sense that the central staff becomes not merely an object held by a figure or an attribute of power, but a line along which the bas-relief may be read as a scheme of the opening of the grain: from closed potentiality to manifested, opened and reproducing form.

20.3. The Circle, Crescent and Star

Three signs within the composition of the Sumerian bas-relief may possess particular significance and are proposed within this chapter as a possible morphogenetic sequence: the circle, crescent and star-shaped form. Such a reading must be methodologically qualified from the outset. In ancient art, the circle, crescent and star may possess their own religious, astral, calendrical, divine, ritual or decorative meanings. They may refer to celestial bodies, divine symbols, cultic iconography, signs of power, time or sacred order. They cannot therefore be arbitrarily removed from their historical-cultural context and declared exclusively to be stages in the opening of the grain. At an additional morphological level, however, these forms may be read as a sequence of transition from closed potentiality to an opened structure.

It is precisely this duality that makes them important. On the one hand, the circle, crescent and star belong to the language of ancient symbolism. On the other, they are simple and powerful morphological forms. The circle is closed, integral and centred, separated from the surrounding space by a boundary. The crescent is open and asymmetrical, suggesting an incomplete shell, transition, curvature and partial opening. The star is radial and multirayed, opened from the centre towards the periphery, and demonstrates the outward emergence of form. If these three signs are considered not as isolated symbols, but as a sequence, a processual logic emerges among them: the closed—the opening—the opened. It is this logic that makes it possible to connect them with the theme of the grain and the general A–B–C–D Matrix.

Within this interpretation, the circle may be regarded as a sign of the closed seed or grain. Morphologically, the circle expresses wholeness, boundary, shell, centre and potentiality. It demonstrates no outward movement. It retains form within itself. In this sense, the circle is close to the seed as a closed form within which future growth remains invisible. A grain may be small, dense, enclosed and outwardly simple, yet it contains within itself the possibility of germination,

root, stalk, leaf, ear and new grain. The circle as a form conveys this state effectively: an externally complete shell conceals an internal potential.

It is important to emphasise that the circle does not necessarily 'mean' grain in a direct historical-iconographic sense. Within a particular Sumerian context, it may possess an entirely different meaning. Morphologically, however, it is genuinely capable of expressing closed potentiality. This makes it suitable for the author's reading within the hypothesis of the Matrix. If a bas-relief contains a circle as one of its compositional elements—especially if it is connected with an axis, crescent, star, water or vegetal motif—it may be incorporated into a processual scheme as stage A: the closed beginning. Such an inclusion must remain cautious, but is methodologically possible.

The circle as a closed grain is also connected with the concept of a shell. A seed or grain is protected by a shell that separates its internal form from the external environment. Until the moment of germination, this shell preserves potentiality. It retains the form, but simultaneously confines it. For growth to begin, this closure must be disrupted. The circle within the morphogenetic sequence is therefore not an ultimate ideal form. It is a beginning within which the future form remains condensed. It represents the state 'before opening'. In this sense, the circle is close not only to the grain, but also to the bud, egg, stone, planetary shell and artefact before the application of a sign—to all those forms in which the internal has not yet become external.

Within the proposed interpretation, the crescent may be regarded as a transitional phase of opening. Unlike the circle, it is no longer completely closed. Its form contains a break, openness, curvature, incompleteness and direction. It appears to demonstrate the moment at which the shell has ceased to be whole, although the form has not yet opened completely. The crescent may therefore be read as stage B: the beginning of opening and the transition from a closed state to a manifested one. It is not yet a complete radial form, but it has already brought the form out of a state of absolute closure.

Morphologically, the crescent is especially interesting because it retains the memory of the circle. Its arc resembles part of a circumference. It does not destroy the original closure completely, but appears to show its fragment, an opened contour or incomplete shell. It is therefore an intermediate form: the circle has already been disrupted, but star-shaped radiality has not yet been achieved. The crescent may be perceived as a moment of tension between retention and opening. It remains connected with the shell, yet already opens space. It is therefore particularly suitable as a sign of transition.

Within the context of the grain, the crescent may be compared with the phase of swelling, rupture of the shell, appearance of the first fissure, beginning of germination or opening of the internal structure. When grain enters an environment of moisture, warmth and earth, it ceases to be merely a closed body. Its shell begins to change, the internal force of growth seeks an exit, and a root or shoot disrupts the boundary. This moment does not yet constitute a complete plant, but it already marks the beginning of the process. The crescent as a form makes it possible to express such transitionality: it is open, but not yet multiple; it is directed, but has not yet unfolded in every direction.

Caution is nevertheless required here as well. Within ancient symbolism, the crescent may be connected with the Moon, time, cycles, a deity, calendrical rhythm or celestial order. Such meanings are not negated by the morphological reading. On the contrary, they may even reinforce it, because the lunar cycle is itself connected with phases, change, growth and the diminution of

visible form. It cannot, however, be claimed that every crescent within a Sumerian bas-relief represents the opening of the grain. It is more accurate to say that, within the author's morphogenetic interpretation, the crescent may be regarded as a transitional form if it forms part of a compositional sequence with the circle and star-shaped sign.

Within this sequence, the star-shaped form may be read as the stage of complete opening. Unlike the circle, it is not enclosed within itself. Unlike the crescent, it is not a partially opened shell. The star possesses a centre and rays. It demonstrates propagation from an internal point towards the periphery. Its form is radial, outwardly directed and multiple. If the circle retains the internal and the crescent begins to open the boundary, the star demonstrates the complete emergence of the internal into the external. Within morphogenetic logic, this corresponds to stage C: the opened form.

The star-shaped form may be compared with the opening of a shoot or flower, radial propagation, energetic emergence and the appearance of multiple directions. Within the context of the grain, it may symbolically correspond to the moment at which concealed potentiality has already become a manifested structure. The grain is no longer merely a closed body; its internal force has produced a direction of growth. More broadly, the star may express not only germination, but the complete emergence of form into space: rays diverge from the centre as the root and shoot emerge from a seed, leaves subsequently extend from a stalk, petals radiate from a flower, and new grains are dispersed from an ear within the reproductive cycle.

Within the Sumerian context, the star-shaped form may, of course, possess an astral or divine meaning. It may signify a celestial principle, deity, emblem of a higher order, heavenly body or symbol of sacred power. Morphologically, however, its structure remains radial. It may therefore be incorporated into the author's scheme as a sign of opening. It is important here to distinguish symbolic meaning from structural function. The star may be a celestial sign in cultural terms while simultaneously serving as a model of radial opening in morphological terms. These levels do not exclude one another, provided they are not confused.

The sequence 'circle—crescent—star' is especially important because it demonstrates the transition from an enclosed to a radial form. Within the circle, internal energy appears still to be retained. Within the crescent, the shell is already open, but the form has not yet become multiple. Within the star, the centre has already produced directions. This may be regarded as a miniature model of morphogenesis. It does not describe every biological detail of the germination of grain, but it records the general logic: potentiality, transition and manifestation. Such generalised schemes are characteristic of the cultural artefact. It does not depict the process in the manner of a scientific botanical illustration; it translates the process into a sequence of signs.

From this perspective, the three signs may be compared with three states of form. The circle is a state of concentration. The crescent is a state of opening tension. The star is a state of unfolded multiplicity. This logic has already appeared repeatedly. The seed contains the future form. The bud begins to open. The flower demonstrates radial completeness. Stone conceals an internal structure, while a fracture reveals it. The artefact brings an internal image to the surface. The World Tree rises from its concealed root into its crown. The Sumerian bas-relief now makes it possible to examine the same logic in a cultural-symbolic form: the closed sign, transitional sign and opened sign.

It is important that this sequence may be understood not only as the development of the grain, but also as the development of the sign. The circle is the simplest and most enclosed figure. The crescent is already a transformed circle, a section of a circumference and an open form. The star

is a more complex figure in which the centre produces rays. Even geometrically, therefore, these forms may be arranged in an order of increasing complexity and opening. The circle is minimal and integral. The crescent contains incompleteness and direction. The star contains multiplicity and radiality. This makes the sequence 'circle—crescent—star' morphologically convincing irrespective of the particular symbolic meaning of each sign.

The process of the opening of the grain does not, however, conclude with the star-shaped form. If the star represents the complete opening of the internal structure, the form must subsequently enter the environment, produce growth, a plant, fruit and new grain. Within this chapter, therefore, the star corresponds not to the conclusion of the entire cycle, but to the completion of its first phase—the phase of opening. It must be followed by stage D: interaction with water, earth, vegetation and reproduction. The following section of the chapter will consequently examine a second bas-relief in which water, plants and the motif of reproduction make it possible to continue the process. The circle, crescent and star demonstrate the internal logic of opening; water and the plant demonstrate the incorporation of this opened form into a living environment.

Within the A–B–C–D model, this sequence may be described as follows:

- A is circle: closed grain, potential wholeness and form within a shell;
- B is crescent: opening of the shell, transition and the beginning of the emergence of the internal into the external;
- C is star: complete opening, radial propagation and manifested structure;
- D is water and plant: the entry of the opened form into the environment, germination, growth, reproduction and the formation of new grains.

This scheme should not be perceived as a literal decipherment of the Sumerian bas-relief. It is the author's morphogenetic model of interpretation, making it possible to recognise a potential sequence of form generation within the signs.

The transition from circle to crescent is especially important. Visually, it demonstrates the disruption of closure. If the circle is a complete boundary, the crescent preserves part of that boundary while leaving space open. This may be understood as the moment when form still retains the memory of its original state, but no longer coincides with it. Within a biological process, such a stage might correspond to the swelling of a seed, the first rupture of its shell or the appearance of the embryonic root. Within a cultural scheme, it is expressed not through a botanical drawing, but through the sign of an incomplete circumference. Herein lies the power of the symbol: it does not copy the process, but records its structural essence.

The transition from crescent to star demonstrates not merely the opening of the shell, but the emergence of the centre into the external world. The crescent possesses an arc, but no rays. The star possesses rays. The crescent remains connected with the contour, whereas the star is connected with directions extending from the centre. Within morphological logic, this corresponds to the transition from the rupture of the shell to active propagation. The shoot no longer merely disrupts the boundary of the grain; it begins to create a new form. The radiality of the star acts as a symbolic intensification of the process: internal energy becomes an external multirayed structure. This is not botanical precision, but morphological expressiveness.

The circle, crescent and star may also be regarded as three different relationships to the centre. Within the circle, the centre is concealed inside a closed circumference. It exists, but does not act outwards. Within the crescent, the centre appears to have shifted or opened: the form no longer maintains uniform closure, and a direction emerges. Within the star, the centre becomes

an active source of rays. The entire sequence may therefore be described as an activation of the centre. The centre is first potential, the shell is then disrupted, and finally the centre begins to radiate or propagate form. This is especially important to the hypothesis of the Matrix because many morphogenetic processes are connected with the transition from a concealed centre to an active periphery.

Such a reading is also connected with the theme of the active edge. Within the circle, the edge is closed and retains form. Within the crescent, the edge is open, tense and incomplete, functioning as a boundary of transition. Within the star, the edge becomes multirayed, sharply differentiated and directed outwards. The sequence may consequently be regarded as a transformation of the edge: protective shell—opened arc—active radial edge. Within natural forms, transformations of the edge are frequently connected with growth: the edge of a leaf, petal, shell, crack, root or shoot becomes a zone of interaction with the environment. In the bas-relief, this transformation is recorded through signs.

The circle as shell-edge, the crescent as transitional edge and the star as propagating edge form an important morphological sequence. It demonstrates that form may change not only internally, but also through its boundary. A seed begins to germinate when its boundary ceases to be completely closed. A bud opens through the edges of its petals. An artefact becomes a sign through its surface. A bas-relief emerges from the plane through its relief edge. In this sense, the circle, crescent and star may be read as three states of the boundary of form.

Within the Sumerian bas-relief, these signs may be arranged in relation to the central staff. If the staff establishes a vertical axis, the circle, crescent and star may form a sequence of states around it. The staff and the three signs then function together. The staff provides direction, the circle the beginning, the crescent the transition and the star the opening. Such a composition may be presented as a visual grammar of morphogenesis. It does not require a literal representation of grain, because the grain is already represented as an abstract closed form. The process of opening is conveyed through changes in geometrical state.

This geometrisation of process is characteristic of ancient symbolic systems. Culture frequently does not represent a complex natural process naturalistically, but identifies several stable signs. Sun, Moon, star, tree, wave, serpent, seed, circle, staff and rosette may all function as condensed forms of experience. Details are lost through this condensation, but structural power is preserved. The circle, crescent and star may therefore be understood as signs possessing a high level of generalisation. They do not represent a particular grain, but may represent states of form: closure, transition and opening.

It is also important to consider that these three signs may be connected with the celestial cycle. The circle, crescent and star naturally evoke astral associations: the Sun or disc, Moon and star. If such an astral meaning is present, it does not necessarily contradict an agricultural-morphological reading. Within ancient agricultural cultures, celestial cycles, the time of sowing, water, harvest and fertility were frequently interconnected. Lunar and stellar rhythms could be incorporated into calendrical thought, while the calendar itself was incorporated into the agricultural cycle. Astrality and grain need not therefore be placed in opposition. Their connection must nevertheless be formulated cautiously, without asserting direct identity.

The circle, crescent and star may be said simultaneously to belong to celestial symbolism and to be morphologically suitable for describing stages of opening. The celestial level gives them cultural authority and cosmological scale. The morphological level permits them to be read as changing forms. In this case, the bas-relief connects heaven and grain, cosmos and agriculture,

sign and process. Within the Sumerian cultural environment, where the order of the world, water, harvest and divine sanction were closely connected, such multilayeredness does not appear artificial. Specific conclusions, however, must always depend upon an analysis of the particular monument.

It is especially important not to transform this interpretation into a claim concerning a 'secret universal formula' supposedly encoded unambiguously within the bas-relief. A scientifically responsible formulation must be different: a morphogenetic reading may be proposed in which the circle, crescent and star form a sequence of closure, transition and opening. This reading does not negate other meanings or claim exclusivity. It demonstrates that ancient visual material may be regarded as structurally compatible with the principal scheme of this study. It is precisely such a cautious formulation that allows the Sumerian bas-relief to be incorporated into the hypothesis without methodological arbitrariness.

The visual illustration for this section should demonstrate the sequence with maximum clarity (*Fig. 2*). It may be constructed as an analytical diagram:

- circle is closed form;
- crescent is opening shell;
- star-shaped form is radial opening.

The vertical axis of the staff may be shown at the centre or nearby in order to emphasise the connection with the preceding section. The image should not, however, contain direct textual labels within it if it is intended for the book layout. It should explain the process visually: from a closed contour to an open arc and thence to a radial form. If necessary, a separate caption beneath the illustration may clarify that it represents a morphological interpretation rather than a literal archaeological decipherment.

Such an illustration is especially important because it helps the reader to recognise the distinction between a sign and a stage. A given sign may possess a historical meaning, but within the diagram it is considered according to its form. The circle as a form is closed. The crescent as a form is partially open. The star as a form is radially opened. It is precisely this morphological clarity that makes the sequence convincing. Even if the reader does not accept the entire hypothesis, it is possible to observe that the sequence genuinely demonstrates a change in the state of form. This already provides a foundation for further discussion.

When this sequence is connected with the process of the grain, it becomes clear that it expresses not an agronomic detail, but a philosophy of germination. The grain begins as a closed form. It then disrupts its own shell. Its internal structure subsequently emerges and begins to create directions of growth. For this process to become a life cycle, however, an environment is required: water, earth, light and time. The circle, crescent and star therefore constitute only the first part of the morphogenetic sequence. They demonstrate the internal transition of form. The second bas-relief, connected with water, plants and reproduction, should demonstrate the external stage: the incorporation of the opened form into the environment and the continuation of life.

Thus, the circle, crescent and star may be regarded as three signs of the opening of the grain within a cultural-morphological reading of the Sumerian bas-relief. The circle corresponds to closed potentiality. The crescent corresponds to a transitional phase in which the shell has already opened, but the form has not yet attained complete manifestation. The star corresponds to radial opening, in which the centre begins to act outwards. Together they form a concise visual formula: closure—opening—manifestation. This formula does not replace the historical

meanings of the signs, but makes it possible to incorporate them into the principal morphogenetic scheme of the study. Through it, the bas-relief begins to be read not only as a sacred image, but also as a possible model of a process in which grain, sign and Matrix are united through form.

20.4. The Second Bas-Relief: Water, Plants and Reproduction

If, within the author's morphogenetic interpretation, the first bas-relief allows the sequence 'circle—crescent—star' to be regarded as a transition from closed potentiality to an opened form, the second bas-relief carries the analysis into the next stage of the process. What now becomes important is not only the internal opening of the grain, but also its entry into an environment: water, earth, vegetal form, the cycle of nourishment and reproduction. In other words, the first bas-relief may be read as a scheme of opening, while the second may be read as a scheme of the continuation of life after opening. It is this that makes the two images complementary within the logic of the chapter.

This approach requires the same caution as the preceding section. The second bas-relief cannot be regarded as a direct botanical illustration of the germination of grain. It belongs to a cultural, ritual and artistic system, while its elements may possess meanings of their own that cannot be reduced to the morphogenesis of a plant. Water may be a sign of a deity, ritual purification, fertility, a river, canal or vital force. Plants may possess cultic, economic, decorative, sacred or symbolic meanings. Figures, vessels, streams, animals, branches or ornamental elements may belong to a particular scene, rite, myth or composition of status. The morphological reading must therefore not replace the historical-cultural one. It merely adds a question: how might these elements be read as a scheme of the further development of form?

Within the context of this chapter, water becomes a key element. Grain does not open within a void. It requires an environment: moisture, earth, temperature, time and contact with the soil. Without water, grain remains closed potentiality or dies. Water disrupts its immobility, initiates swelling, activates internal processes, and makes possible the rupture of the shell and the emergence of the shoot. Within morphogenetic logic, therefore, water corresponds not merely to an external background, but to a condition of transition. It is the medium through which the closed grain acquires the possibility of becoming a plant.

Water possessed particular significance within the Sumerian cultural context. Ancient Mesopotamia was a civilisation of rivers, canals, irrigation, fields and harvests. Water was not an abstract symbol, but a condition of urban life, agriculture and social order. It could destroy when it arrived as a flood and give life when directed through canals and irrigation. The aquatic motif within the bas-relief may therefore be read on several levels: as a natural force, economic condition, sacred resource, sign of fertility and morphological environment for the opening of the grain. It is precisely this multilayered character that makes water the most important element of the second bas-relief.

If the first bas-relief demonstrates a symbolic sequence of internal changes in form, the water within the second demonstrates that opening must be incorporated into a flow. Grain may possess internal potential, but that potential cannot be realised without an environment. The stage of opening requires contact with the external. In this sense, water is a mediator between the internal form of the grain and the external world of growth. It penetrates the shell, changes the

state of matter, makes the movement of the embryo possible and connects the grain with the earth. Morphologically, water transforms the form from a state of rest into a state of process.

Visually, water is frequently expressed through undulating lines, streams, jets, vessels, rivers, canals, repeated waves or zigzag elements. In the preceding chapter, the wave and zigzag were already examined as cultural records of movement, flow, folding and tension. Within the Sumerian material, the aquatic line may acquire an even more specific meaning: it connects cosmic, terrestrial and agricultural order. Water does not merely move; it nourishes. It is not merely a line, but a medium. It is not merely a symbol, but a condition of growth. The aquatic motif within the second bas-relief may therefore be read as a transition from the opening of form to its living development.

Plants within the second bas-relief are also of fundamental significance. If the circle represents the closed grain, the crescent the phase of opening and the star radial manifestation, the plant demonstrates that the opening has become a new body. Potentiality has not merely opened; it has entered the process of growth. A plant possesses an axis, leaves, branches, flowers, fruit or ears. It demonstrates the transition from a small closed form to an unfolded living structure. In this sense, the vegetal motif is a continuation of the star-shaped phase: radial opening passes into an organic form connected with water, earth and further reproduction.

The motif of germination is especially important. Germination is the moment at which grain ceases to be merely grain and becomes the beginning of a plant. Two directions emerge within it: the root descends and the shoot rises. This primary division of directions is one of the most important morphogenetic events. The closed form acquires an axis. The internal becomes external. The potential begins to divide into levels: the concealed root and the manifested shoot. If the second bas-relief contains motifs of water, vegetation or a shoot, it may be read as a visual record of precisely this stage: form enters the environment and begins to construct a new vertical.

Such a reading is particularly important to the connection between this chapter and the chapter on the World Tree. There, the tree was examined as a universal model of growth: root, trunk, branches, crown, fruit and seed. Within the second Sumerian bas-relief, it is possible to recognise an earlier or more condensed stage of the same algorithm: the grain enters an aquatic-terrestrial environment, opens, produces a shoot, becomes a plant and then returns form to a new grain. If the World Tree demonstrates a complete and fully developed image of vertical morphogenesis, the Sumerian bas-relief may record its agricultural-ritual foundation: grain, water, plant, fertility and reproduction.

The second bas-relief therefore expands the scheme from sign to environment. The first bas-relief may be presented as an internal diagram of form: circle, crescent and star. The second may be presented as an ecological and cultural diagram of the process: water, plant, fertility and new grain. This distinction is important. Morphogenesis cannot be reduced solely to internal structure. Every form opens within an environment. A seed requires earth and water. A tree requires soil, air and light. An artefact requires material, the craftsman’s hand and tradition. Even cosmic forms depend upon an environment of matter, radiation, gravity and movement. The second bas-relief therefore helps to demonstrate that the A–B–C–D Matrix must include not only the stages of form, but also the conditions of its realisation.

In this connection, water may be regarded as an active environment. It does not merely surround the grain, but changes it. It enters the shell, causes swelling, dissolves, transports, nourishes and connects. Within culture, water frequently becomes an image of life precisely because it does not remain external. It passes through form and changes its state. Morphologically, this may be

described as the transition from a closed boundary to a permeable one. The circle as a closed shell becomes an opening form only when its boundary enters into interaction with the environment. Water activates the boundary.

The plant emerging from the grain demonstrates the next stage: the formation of a new axis. If the staff within the first bas-relief was the cultural axis of the process, the shoot within the second bas-relief is the natural axis arising from the opened grain. This is an important comparison. The staff organises the visual composition. The shoot organises the living form. Both elements are connected with verticality, but belong to different levels: one artefactual and symbolic, the other biological and agricultural. Within a morphological reading, they may be compared as two forms of axial organisation: the cultural axis and the living axis.

If vegetal stalks, ears, shoots, branches or conventional plant elements are present within the image, they may be regarded as signs that the propagation of form has already begun. The grain is no longer concealed. It has become a plant that interacts with the world through its leaves, stalk, root and fruiting zones. An ear or fruiting motif, if present, is especially significant: it demonstrates a return to grain, but at a new level. One grain produces a plant, while the plant produces a multiplicity of grains. This is the transition from singular potentiality to multiple reproduction.

In this sense, the second bas-relief may be read as a model of the multiplication of form. The closed form does not open merely for the sake of its own manifestation. It opens in order to generate new forms. The grain becomes a plant, the plant produces new grains, and the new grains once again become potential forms. Within the A–B–C–D model, this corresponds to stage D: the completed or opened form passes into reproduction and creates a new beginning. It is stage D that transforms the process into a cycle rather than a linear movement. Without reproduction, the circle—crescent—star would remain a beautiful sequence of opening. With reproduction, they become part of a life cycle.

If the bas-relief contains vessels or streams, these may also be incorporated into the morphological reading. A vessel may be connected with water, storage, sacrifice, nourishment, ritual, fertility or the distribution of resources. Morphologically, a vessel is a form that contains an environment. It resembles a shell, but unlike the grain it does not conceal a future form within itself; rather, it stores and directs the substance required for the process. Water within a vessel, a stream issuing from a vessel, irrigation or undulating lines may indicate a controlled environment. This is especially important to an agricultural civilisation: water must not only be provided by nature, but also directed by culture.

The second bas-relief may consequently be read as a scene uniting natural and cultural order. Grain germinates through water, but within civilisation water is often organised through canals, vessels, rituals and social control. The plant grows naturally, but agriculture incorporates human action. The bas-relief records not only a biological process, but also the cultural understanding of that process: the growth of grain forms part of a sacred and social world. In this sense, the morphogenesis of grain within the Sumerian material is not isolated from civilisation. It is incorporated into the order of water, field, power, ritual and image.

It is especially important that the second bas-relief may demonstrate not a single moment, but the continuation of a process. The visual code here becomes more narrative. Water indicates an environment. The plant indicates growth. Fruit or grain indicates reproduction. If these elements are compositionally connected, they form a sequence: environment—germination—plant—fruit—new seed. This is no longer merely the opening of an internal shell, but the incorporation of

form into a cycle. Such a sequence is particularly important to the study as a whole because the A–B–C–D Matrix always tends towards cyclical completion: D is not the end, but creates a new A.

The distinction between opening and reproduction must be emphasised at this point. Opening is the emergence of the internal into the external. Reproduction is the capacity of the opened form to create a new closed potentiality. A flower opens, but must subsequently produce fruit and seed. A tree grows, but then bears fruit. Grain germinates, but the plant must subsequently produce new grains. An artefact manifests an internal cultural image, but that image may then be repeated within tradition. Stage D is therefore always connected not merely with completion, but with the transmission of form. The second bas-relief is important precisely because it makes it possible to recognise this transmission through water and the plant.

Water, plant and reproduction form a triad of continuation. Water activates. The plant unfolds. Reproduction returns. Water makes the opening of the grain possible. The plant demonstrates the development of the opened form. Reproduction creates new grains—that is, new closed forms. This triad corresponds particularly well to the general logic of the Matrix: environment—growth—cycle. Without an environment, form does not open. Without growth, it does not become a manifested structure. Without a cycle, it cannot transmit itself onwards. The second bas-relief may therefore be regarded as a cultural record of precisely this logic.

Morphologically, water and plant are also connected through line. Water is frequently represented by an undulating line, while the plant is represented by an axial and branching line. The wave and stalk are different, but within a composition they may be connected as two forms of movement: the horizontal or flowing movement of water and the vertical movement of growth. Water flows; the plant rises. Water surrounds and nourishes; the stalk gathers and directs. If these motifs appear beside one another within the bas-relief, it is possible to speak of the union of horizontal flow and vertical axis. This union is exceptionally important to agricultural morphology: water moves across the surface or through the soil, while the shoot rises upwards.

This transition from the horizontal to the vertical resembles the structure of a tree: roots spread through the earth, the trunk rises upwards, and branches open towards the sides. Within the grain, this scheme emerges in miniature. Water first enters the closed form. The root then descends and the shoot rises. The plant subsequently develops and begins to branch or form leaves. The second bas-relief may therefore be read as an image of the early stage of the same universal algorithm of growth examined through the World Tree in the preceding chapter.

If several plants or repeated vegetal elements appear within the image, this intensifies the theme of reproduction. One grain does not produce a single immobile form, but multiplicity. The repetition of plants may be decorative, but morphologically it indicates multiplication. Within an agricultural context, this is especially important: the value of grain lies in its capacity to become a harvest. One grain returns as a multiplicity of grains. A vegetal sequence within the bas-relief may therefore be read as a visual model of abundance, fertility and the cyclical increase of form.

Abundance, however, is not chaos. It is organised. Plants may be arranged symmetrically, in rows, around a central figure, beside water, near a vessel or along the compositional axis. Such organisation demonstrates that reproduction is incorporated into order. Growth does not merely occur; it is structured. This was especially important to Sumerian civilisation, in which agriculture depended upon the complex organisation of water and labour. The morphological scheme of growth is united here with the social scheme of order. The bas-relief may speak simultaneously of fertility and its organisation.

It must once again be emphasised that this is a possible morphological reading. A particular bas-relief may possess an established religious or historical interpretation, which must be preserved. If, however, its visual structure includes water, plants, streams, vessels, repetition and signs of fertility, it may be read within the present study as a continuation of the process of the opening of the grain. This reading is especially justified after the analysis of the circle, crescent and star because it demonstrates that opening does not remain an abstract sign, but enters a life cycle.

The second bas-relief also helps clarify the significance of the star-shaped form from the preceding section. If the star represented the stage of complete radial manifestation, water and the plant demonstrate that manifestation must be functional. Form does not open merely for the sake of openness, but for the purpose of further interaction with its environment. The shoot must enter the soil and air. The plant must receive nourishment, grow and produce fruit. In this sense, the star as an opened form requires continuation. It is a moment of transition to the next level—the level of environment and reproduction.

This transition is especially important to the understanding of stage D. In certain developmental schemes, stage D might be perceived as definitive completion. Within the hypothesis of the Matrix, however, D is not an end, but a phase of transition towards a new cycle. In the second bas-relief, this is expressed through the motifs of water and vegetation. Water returns form to the environment. The plant creates a new form. Fruit or grain returns the process to closed potentiality. D therefore both completes and begins. Read morphologically, the bas-relief becomes an image not of an ending, but of a reproductive cycle.

The connection between water and the lower level of the composition has particular significance. If water is situated within the lower zone, it may be read as the environment of the foundation, analogous to the root or soil. If it flows from a vessel or the hands of a figure, it may be connected with a ritual act of animation, nourishment, blessing or irrigation. If it surrounds plants, it demonstrates their connection with the living environment. In each case, the aquatic motif is not merely a background, but an active element. It connects the closed form of the grain with the external conditions of growth.

The plant, in turn, may occupy either a central or lateral position. If central, it may function as an axis of life. If lateral, it may demonstrate the result of the action of water or fertility. If several plants are present, they may demonstrate multiplication. If the plant is connected with a figure, it may form part of a ritual. If it is connected with a vessel, it may indicate nourishment and irrigation. These distinctions are important to a specific analysis, but within the general logic of the chapter they help to demonstrate that the vegetal motif is the bearer of the stage of unfolded growth.

The visual illustration for this section may be constructed as an analytical diagram of the second bas-relief (*Fig. 3*). It should present not an exact copy of a historical monument, but a generalised morphological model:

- in the lower part, water or undulating lines as the environment;
- at the centre, a grain or shoot entering water and earth;
- above, a plant as a vertical form;
- nearby or in the upper zone, fruit or new grains as a sign of reproduction.

A conventional axis may be added to connect the diagram with the staff from the preceding section. It is important, however, not to overload the image or create the impression of an

archaeological reconstruction. The illustration must be expressly analytical: water—germination—plant—new grain.

Such a diagram will help the reader to see that the second bas-relief continues the first. The first demonstrates the internal stages: closed form, transition and opening. The second demonstrates their external realisation: environment, growth and reproduction. Together they form a unified morphogenetic line. This is especially important to the following section, in which the bas-reliefs will be connected with the A–B–C–D Matrix. Without the second bas-relief, the scheme might end at the stage of the opened star. With it, the scheme reaches completion within the life cycle: the opened form enters the environment and creates a new potentiality.

The second bas-relief also demonstrates that the morphogenesis of grain is not only an individual process, but also a collective and civilisational one. Grain within an ancient agricultural culture is not merely a biological object. It is the foundation of nourishment, labour, storage, exchange, ritual, power and time. The germination of grain is connected with the fate of society. Water and plants within the bas-relief may therefore possess meanings extending far beyond botany. They demonstrate an order of life within which the natural cycle and cultural organisation are inseparable. This is precisely why the Sumerian material is so important: it makes it possible to recognise morphogenesis not as an abstract process, but as the foundation of civilisational experience.

In this respect, the second bas-relief constitutes a cultural model of reproduction. It is not only the plant that is reproduced, but also order. The harvest reproduces the life of the city. Ritual reproduces the connection with the sacred. The image reproduces a scheme of order within matter. The grain reproduces the plant. The plant reproduces the grain. The bas-relief reproduces the cultural memory of the process. This multiplicity of reproduction makes the second bas-relief particularly significant to the hypothesis of the Matrix. It demonstrates that form may return at different levels: biological, economic, ritual, symbolic and artistic.

It is here that a profound connection between the grain and the artefact becomes visible. The grain contains the future form of the plant. The artefact contains the cultural form of the process. The grain opens in water and earth. The artefact manifests an image upon its surface. The plant produces new grains. The bas-relief transmits the image to future generations. In both cases, there is a concealed form, opening, environment and reproduction. The Sumerian bas-relief may therefore be incorporated into the general logic of the study not because it literally depicts the Matrix, but because it culturally records a cycle close to the morphogenetic scheme.

Such an analysis also makes it possible to clarify the role of the human being. Within the natural cycle, grain germinates when the appropriate conditions are present. Within an agricultural culture, human beings create or regulate these conditions: they sow, irrigate, protect, harvest, store, make sacrifices, create images and transmit knowledge. Within the bas-relief, the human being may be represented as a participant in the process and a mediator among water, plant, divine order and harvest. If a figure appears beside water or a plant, it may be regarded not only as a character within the scene, but also as an element in the cultural management of growth. Morphologically, the human being is incorporated into the cycle of the opening of the grain as an organiser of the environment.

This is especially important to the cultural-symbolic level of the Matrix. At natural levels, form arises without human participation. At the cultural level, human beings recognise, direct, symbolise and reproduce form. The second bas-relief demonstrates this connection with particular clarity: grain and plant belong to nature, water belongs to both the natural and

economic environments, and the image belongs to culture. The bas-relief unites them. It may therefore be regarded as a cultural record of the moment at which natural morphogenesis becomes part of a social and sacred order.

Ultimately, the second bas-relief makes it possible to extend the scheme of the opening of the grain beyond the first three signs. The circle, crescent and star demonstrate the internal transformation of form: closure, transition and opening. Water, plants and reproduction demonstrate the subsequent fate of the opened form: entry into the environment, growth, multiplication and return to new grain. It is this continuation that makes the process complete. Without water, grain does not open. Without the plant, opening does not become life. Without reproduction, the plant does not return form to a new beginning. The second bas-relief is therefore an essential element of the chapter: it transforms the morphogenetic scheme from a sequence of signs into a life cycle.

Thus, the second bas-relief may be regarded as a visual model of stage D within the expanded A–B–C–D Matrix. It demonstrates not a conclusion in the form of the opened star, but the incorporation of opening into an environment and reproductive cycle. Water acts as the condition of activation, the plant as the manifested form of growth, and fruit or grain as the return to potentiality. This reading remains supplementary and authorial, but it makes it possible to connect the Sumerian material with the principal logic of the study. Understood in this way, the bas-relief becomes not only a monument of ancient culture, but also a materially fixed scheme of how a closed form enters the world, opens, receives nourishment, grows and generates new forms.

20.5. The Bas-Reliefs and the A–B–C–D Matrix

The Sumerian bas-reliefs examined in this chapter acquire particular significance only when they are incorporated not into an arbitrary sequence of symbolic associations, but into a rigorous morphogenetic scheme. Within this book, that scheme is the A–B–C–D Matrix, which makes it possible to describe the transition of form from a closed potential state to opening, subsequent interaction with the environment and reproduction within a new cycle. It is precisely this Matrix that enables a cautious yet consistent reading of the Sumerian material: the circle, crescent, star, water, plant and grain are considered not as isolated decorative or cultic elements, but as possible stages of a single process.

The methodological boundary must nevertheless be emphasised once again. This does not mean that Sumerian craftspeople consciously depicted the A–B–C–D model in the form in which it is formulated within this book. Nor does it mean that the bas-reliefs constitute direct proof of the universal Matrix. They belong to a specific historical culture and possess their own religious, iconographic, ritual, social and artistic contexts. They cannot therefore be detached from the Sumerian and, more broadly, Mesopotamian traditions. At an additional morphological level, however, these images may be read as visual schemes of the transition of form: from closed grain to opening, from opening to growth, and from growth to reproduction.

In this case, the A–B–C–D Matrix acts as a language of analysis. It does not impose a pre-existing meaning upon the bas-relief, but makes it possible to organise the observable features. If a circle is present within the composition, it may be regarded as a closed form. If a crescent appears beside it or as part of a sequence, it may be read as a transitional phase of opening. If a star-

shaped form subsequently emerges, it may be compared with complete radial opening. If the second bas-relief introduces water, plants, fruits or grains, it may be regarded as a continuation of the process: the opened form enters the environment, germinates, becomes a plant and returns to a new potentiality. Separate signs are thereby united into a morphogenetic sequence.

Stage A within this scheme corresponds to closed potentiality. In this chapter, it has been connected with the circle as a possible sign of grain or seed. The circle is closed, integral and centred, and is separated from external space by a boundary. It expresses a state in which the future form remains concealed. Grain in such a state is externally small and simple, yet internally contains the possibility of growth. It is not yet a plant and possesses no visible root, stalk, leaves or ear, but already carries the future algorithm of form. The circle consequently provides a suitable morphological model of stage A: form is present as potential, but has not yet opened.

Stage A is important to the entire hypothesis of the Unified Matrix of the Universe because it demonstrates that the beginning of form does not necessarily appear complex. Seed, grain, bud, egg, closed shell, stone, planetary body, central point and circle may all be externally simple while containing an internal possibility of development. Within the Sumerian material, the circle may be incorporated into this broader sequence of closed forms. It does not prove that what is depicted is literally grain, but morphologically corresponds to a state of enclosed potentiality. It therefore occupies the initial position within the A–B–C–D model.

Stage B corresponds to the beginning of opening. Within this chapter, it has been connected with the crescent. The crescent retains the memory of the circle, but is no longer a complete circumference. Its form is open, asymmetrical, tense and transitional. It demonstrates the disruption of complete closure. If the circle retains the internal, the crescent begins to bring the internal into the external. Within the context of the grain, this may be compared with swelling, the rupture of the shell, the appearance of the first fissure and the beginning of germination. In a more general morphological sense, it is the stage at which form ceases to be completely closed, but has not yet become completely opened.

Stage B is especially important because it is here that transition occurs. Any hypothesis of morphogenesis must explain not only the initial and final states, but also the intermediate moment. A seed does not become a plant instantaneously. A bud does not become a flower without a phase of opening. An artefact does not emerge without the transition of an internal image into material. Relief does not arise without an extended process of deformation, erosion and exposure. Within this scheme, the crescent is a sign of transitionality: it is no longer A, but is not yet C. It records the moment when the shell ceases to be absolute and form acquires the possibility of further manifestation.

Stage C corresponds to complete opening. Within the chapter, it has been connected with the star-shaped form. The star possesses a centre and rays; it is radial, open and directed outwards. If the circle demonstrates closure and the crescent partial opening, the star demonstrates the active propagation of form from centre to periphery. Within morphological logic, this is the stage of manifestation. The internal has already emerged into the external. The centre has become active. The boundary has ceased to be merely a shell and has become a radial, multiple and opened structure.

The star-shaped form is especially important because it connects centre and multiplicity. The centre does not disappear within it, but begins to act outwards. The rays do not exist independently; they remain connected with the centre. The star therefore provides a suitable sign of opening—one that is organised rather than chaotic. Within the context of the grain, it may be

understood as a symbolic phase of the complete manifestation of internal potential. More broadly, it corresponds to forms already examined within the book: the flower, opened bud, radial nebula, ray-like structure and active edge. The Sumerian sign is thus incorporated into the general sequence of radial opening.

Stage C does not, however, complete the entire process. Once form has opened, it must enter the environment. This is why stage D is required. Within the chapter, it is connected with the second bas-relief, in which water, plants and reproduction make it possible to continue the morphogenetic scheme. The opened form does not remain in a state of abstract star-shaped manifestation. It must interact with water, earth, nourishment, light, environment and cultural order. Once opened, grain must germinate. The shoot must become a plant. The plant must produce fruit or new grain. Only then does the process become a cycle rather than a simple linear sequence.

Stage D within the A–B–C–D Matrix is the most complex because it simultaneously completes and begins. It completes the path of the original form: the grain has opened, entered the environment, become a plant and produced fruit. Yet it also creates a new stage A: new grain once again becomes a closed potential form. D is therefore not a final point. It is the stage of reproduction and return. Water and plants are especially important within the Sumerian material precisely because they move the scheme from a domain of signs of opening into a life cycle. Without them, the circle, crescent and star would remain merely a geometrical sequence. With them, they become part of an agricultural-morphological process.

Within this scheme, water performs the function of an activating environment. It connects the closed form of the grain with the external world. It makes the shell permeable, initiates swelling, nourishes growth and connects earth with plant. Within the civilisation of ancient Mesopotamia, water possessed not only natural, but also economic, ritual and social significance. It was associated with rivers, canals, irrigation, harvests and the life of the city. Water within the second bas-relief may therefore be read as the condition of stage D: the opened form enters a flow, an environment and a system of nourishment and reproduction.

The plant within this scheme constitutes the manifested result of the opening of the grain. If the circle was a closed form, the crescent the beginning of opening and the star radial manifestation, the plant demonstrates that opening has become a living vertical. The plant develops a root, stalk, leaves, ear and fruiting zone. It constructs a new axis and a new system of levels. In this respect, the plant continues the theme of the staff as an axis of morphogenesis. The staff within the first bas-relief was the cultural axis of the process; the plant within the second becomes the natural axis of growth. Their comparison reveals a connection between symbolic verticality and living verticality.

Reproduction completes the scheme. One grain produces a plant, while the plant produces a multiplicity of grains. Closed potentiality returns, but only after the cycle has been traversed. Herein lies the profound meaning of the A–B–C–D model. It does not describe a simple movement from beginning to end. It describes cyclical becoming, in which the end becomes a new beginning. This is precisely why the grain is such a powerful model of the Matrix. It is small, enclosed and potential, yet when incorporated into an environment it opens its form, passes through stages of growth and returns as new grain. It is an almost ideal natural-cultural model of morphogenesis.

The Sumerian bas-reliefs within this chapter may be regarded as two parts of a single expanded scheme. The first bas-relief records the internal morphology of opening: circle, crescent, star and

the staff as axis. The second records the external realisation of the process: water, plant, fertility and reproduction. In the first case, the emphasis falls upon signs representing states of form. In the second, it falls upon the environment and the continuation of life. Together they produce the sequence: closed grain — opening shell — radial manifestation — water and growth — new grain. This sequence corresponds to the general logic of A–B–C–D and demonstrates how cultural material may be incorporated into the principal scheme of the study.

It is especially important that this scheme does not reduce the bas-reliefs to a single simplistic decipherment. It does not state that a circle always signifies grain, a crescent always signifies opening, a star always signifies complete form, or water always signifies stage D. Rather, it states that, within the author's morphological interpretation presented here, these elements may be united into a processual sequence if their compositional arrangement and cultural context permit such a reading. This qualification is fundamental. It protects the analysis against overinterpretation and leaves space for other scholarly explanations.

In this case, the A–B–C–D Matrix is not a dogma, but an analytical framework. It helps us to ask: is a closed form present within the material? Is there a transitional form? Is there an opened form? Are environment and reproduction present? If all these elements are present and compositionally connected, it becomes possible to speak of a strong morphological reading. If only some of the elements are present, the reading will be weaker. If the elements are not interconnected, the scheme should not be applied. Such an approach makes the hypothesis more rigorous. It does not impose a universal scheme upon every artefact, but tests the extent to which particular material genuinely corresponds to it.

The Sumerian material proves especially interesting in Chapter 20 because it unites three key strata: the agricultural, cosmological and compositional. The agricultural stratum is connected with grain, water, plants, fertility and harvest. The cosmological stratum is connected with the circle, crescent, star, celestial signs and sacred order. The compositional stratum is connected with the staff, axis, arrangement of elements and visual sequence. Morphological interpretation becomes possible precisely at the intersection of these strata. Grain opens within the earth, but its process may be connected with celestial time, water, ritual and the central axis of the image. The bas-relief unites these levels within a single visual structure.

Such a union was particularly characteristic of ancient agricultural civilisations. To modern thought, grain may be merely a biological object, water a natural resource, a star an astronomical object, a staff a symbol of power and a bas-relief a work of art. Within ancient thought, these levels may have been considerably more closely connected. The harvest depended upon water, water upon rivers and canals, the time of sowing upon celestial cycles, the prosperity of the fields upon ritual and social order, and power upon the capacity to preserve that order. The bas-relief could therefore unite what modern classification separates. It is precisely this wholeness that makes it valuable to the philosophy of the Matrix.

Within the hypothesis of the Unified Matrix of the Universe, the Sumerian bas-reliefs demonstrate that a morphogenetic scheme may be culturally expressed through a complex system of signs. In nature, grain opens through a biological process. Within culture, this process may be represented through a circle, crescent, star, staff, water and plant. This is not a literal copying of nature, but a symbolic condensation. Culture takes a process and translates it into a visual code. As a result, the bas-relief becomes not merely an image, but a model of the transition of form.

The bas-relief differs in this respect from the World Tree examined in the preceding chapter. The World Tree is an integral image of growth: root, trunk, branches, crown, fruit and seed. The

Sumerian bas-relief functions differently. It does not necessarily represent the entire process within a single natural object. It distributes the process among signs: circle, crescent, star, staff, water and plant. It is a more discrete model. It resembles not a living tree, but a visual formula. The bas-relief is therefore especially important to the understanding of cultural abstraction: an ancient composition may separate a process into symbolic elements.

This division of the process into elements brings the bas-relief close to the concept of code. A code need not be written. It may be visual, compositional, ritual or ornamental. A visual code operates through recurring signs and the relationships among them. Within this chapter, the circle, crescent and star form a code of the states of form. The staff forms a code of the axis. Water forms a code of the environment. The plant forms a code of growth. New grain forms a code of reproduction. Together they create a visual language of morphogenesis. Even if the ancient culture did not formulate it as 'morphogenesis', the composition may be read as an order of transitions.

The connection between the bas-reliefs and the A–B–C–D Matrix also helps to clarify the Matrix itself:

- A is not merely a beginning, but closed potentiality;
- B is not merely an intermediate state, but the opening of the boundary;
- C is not merely a result, but the complete manifestation of the internal;
- D is not merely a conclusion, but the incorporation of form into the environment and the reproduction of a new beginning.

Within the Sumerian material, these stages acquire figurative expression. The circle helps to explain A. The crescent explains B. The star explains C. Water and the plant explain D. In this way, the bas-reliefs not only illustrate the Matrix, but also make it more readily intelligible.

It is especially important that stage D returns to stage A. Following fruiting, new grain once again becomes a circle, closed form and potentiality. This return completes the cycle. If the scheme is presented linearly, it will appear as a movement from circle to plant. If presented cyclically, however, the plant once again produces the grain-circle. It is precisely this cyclicity that makes the Matrix alive. It does not end with opening. It generates repetition. In this sense, the Sumerian bas-reliefs may be incorporated into the general sequence of forms in which D creates a new A: the flower produces fruit and seed, the tree produces fruit and seed, the artefact creates tradition and repetition of an image, and grain produces new grain.

It is particularly important here to distinguish two types of completion. The first is formal completion: the star-shaped form as complete opening. The second is living completion: new grain as the result of reproduction. In aesthetic or symbolic terms, the star may appear to be the culmination of the process. In morphogenetic terms, however, the culmination is not opening in itself, but the ability of the opened form to generate a new cycle. The second bas-relief, devoted to water, plants and reproduction, is therefore essential. It demonstrates that complete opening does not yet constitute completed morphogenesis. Completion occurs only when form transmits itself onwards.

It is precisely this idea that makes the chapter important to the study as a whole. Certain visual analogies may end with a beautiful similarity among forms: circle, flower, star or nebula. The hypothesis of the Unified Matrix of the Universe, however, demands more. It must demonstrate a process. The Sumerian bas-reliefs make it possible to proceed from sign to process, from

process to cycle, and from cycle to reproduction. This increases the seriousness of the analysis. We do not merely state that ancient signs resemble stages of opening. We demonstrate how they may be connected within a sequence in which every stage possesses a morphological function.

At the same time, this chapter must remain cautious in its conclusions. The Sumerian bas-reliefs cannot be regarded as direct confirmation of the Matrix in the same sense in which natural forms may be subjected to morphometric analysis. A different level of evidence operates here: the cultural-hermeneutic. The bas-reliefs demonstrate that a particular sequence of forms may be read within ancient visual material. They demonstrate the compatibility of cultural signs with a morphogenetic scheme. They do not, however, prove a universal law. Their significance lies in their extension of the hypothesis into the cultural-symbolic domain.

The chapter's concluding observation must therefore be twofold. On the one hand, the Sumerian bas-reliefs cannot be used as definitive proof. On the other, they cannot be dismissed as arbitrary images if they genuinely contain an axis, closed form, transitional form, opened form, water, plant and reproduction. They are of interest as cultural records of a process. This makes them important material for the philosophy of form and the hypothesis of the Unified Matrix of the Universe.

The bas-reliefs also demonstrate that grain is one of the central images of morphogenesis. Grain unites potentiality, shell, concealed structure, dependence upon the environment, germination, growth, fertility, reproduction and cycle. Grain is small, but its logic is immense. It contains the entire path of form in a condensed state. An ancient agricultural culture could therefore intuitively perceive grain as a bearer of the order of life. Within the bas-relief, this order may have been expressed through celestial signs, water, plants, the staff and a ritual composition. Grain thereby becomes not only food, but also a model of the world.

In this sense, the Sumerian bas-reliefs continue the theme of the World Tree, but at a more condensed level. The World Tree presents a complete and unfolded image of growth. Grain presents its initial and cyclical form. The tree is an opened system, whereas grain is its potential node. The tree demonstrates verticality, branching, levels and fruit. Grain demonstrates the closed possibility of that tree or plant. If the tree is an image of the complete morphogenetic cycle, grain is an image of its beginning and return. This chapter therefore follows logically from its predecessor: after the tree as a universal model of growth, grain is examined as a compact model of opening and reproduction.

It is especially important that the bas-reliefs may connect grain with cosmic signs. The circle, crescent and star may possess astral meanings. If they are incorporated into an agricultural process, a connection emerges between the celestial cycle and terrestrial growth. This corresponds to ancient agricultural thought, in which the time of sowing, water, harvest and celestial rhythms were often perceived as parts of a single order. This is especially interesting within the hypothesis of the Matrix: the form of the grain proves to be connected not only with earth, but also with heaven; not only with biology, but also with cosmology; not only with economic life, but also with symbolic order.

Such a connection should not be understood mystically. It may be explained culturally and practically: agricultural life depends upon seasonal cycles, while seasonal cycles are connected with observations of the heavens. Celestial signs and grain may therefore naturally belong to the same symbolic system. Morphologically, this connection demonstrates that form is conceived on several levels. The closed grain, lunar phase, star-shaped opening, water, plant and harvest

may all be incorporated into a single visual grammar. It is precisely this grammar that forms the subject of the chapter.

The A–B–C–D Matrix helps to make this grammar legible. It does not replace the Sumerian context, but provides a language of enquiry for describing transitions. The bas-reliefs may consequently be regarded as cultural material in which ancient visuality encounters the modern philosophy of form. Such a comparison requires caution, but it is productive. It demonstrates that cultural signs may be not only objects of art history, but also bearers of structural relationships: closure, opening, environment, growth and reproduction.

The visual illustration for this section may be constructed as the chapter's concluding diagram (*Fig. 4*). It should demonstrate the connection between the two bas-relief sequences and the A–B–C–D Matrix:

- A — the circle as closed grain;
- B — the crescent as a transitional phase of opening;
- C — the star as radial manifestation;
- D — water, plant, fruit and new grain as reproduction.

Such an illustration must be analytical rather than an archaeological reconstruction. It should clearly demonstrate the cyclical nature of the process: the new grain returns the scheme to stage A. It would be preferable for the composition to be arranged not only linearly, but also with a suggestion of circular return, allowing the reader to recognise that D creates a new A.

Such a concluding illustration is especially useful because the chapter works with several bas-relief elements, and without a diagram the reader may find it difficult to retain the entire sequence. The illustration should not contain complex textual explanations within the image itself. It is sufficient to demonstrate visually the four stages and their connection: the closed circle, opening crescent, radial star, and water and plant returning new grain. A separate caption beneath the illustration should explain that this is not a literal decipherment of a Sumerian monument, but a morphogenetic diagram of the author's interpretation.

The chapter's ultimate meaning is that the Sumerian bas-reliefs may be regarded as a cultural record of the process of the opening of the grain. The first bas-relief provides the symbolic structure of internal opening: circle, crescent, star and axial staff. The second demonstrates its continuation: water, plants and reproduction. Together, they make it possible to connect ancient visual material with the A–B–C–D Matrix. The circle corresponds to closed potentiality. The crescent corresponds to transition. The star corresponds to opening. Water and the plant correspond to environment, growth and return to new grain. This sequence makes the bas-reliefs an important example of cultural-morphological interpretation.

Thus, Chapter 20 demonstrates that the hypothesis of the Unified Matrix of the Universe may engage with ancient art only when strict interpretative boundaries are observed. The bas-reliefs must not be used as direct proof. They may, however, be regarded as visual codes through which an ancient culture recorded the processes of life, fertility, water, growth and reproduction. If these processes correspond to the A–B–C–D Matrix, the Sumerian material acquires a new philosophical-morphological significance. It demonstrates that the scheme of closed form, opening and a new cycle could be expressed culturally long before the emergence of modern scientific language—through relief, sign, staff, water, plant and grain.

Herein lies the place of the Sumerian bas-reliefs within the general structure of the study. They unite the artefact, World Tree and grain within a single cultural-symbolic sequence. The artefact demonstrates how internal form becomes an external sign. The World Tree demonstrates growth, levels and branching. The Sumerian bas-reliefs demonstrate the process of the opening of the grain and its return to the reproductive cycle. Through them, the cultural-symbolic level of the Matrix acquires a more concrete expression: not only general images, but also a sequence of stages that may be compared with the principal A–B–C–D scheme. This is precisely why the chapter constitutes an important step from symbol to process, from artefact to morphogenetic model, and from ancient image to the philosophy of form.

Fig. 1. Staff as an Axis of Morphogenesis: the Central Vertical around Which Signs of Closed, Transitional, and Unfolded Form Can Be Read as Stages of a Process

Fig. 2. Circle, Crescent, and Star as a Morphogenetic Sequence: Closed Seed, Transitional Phase of Unfolding, and Full Radial Manifestation of Form

Fig. 3. The Second Bas-Relief as a Scheme of Process Continuation: Water as an Activating Medium, Plant as Manifest Growth, and Fruit and Seed as the Reproduction of a New Potential Form

Fig. 4. Bas-Reliefs and the A–B–C–D Matrix: Closed Seed, Transition to Unfolding, Radial Manifestation, Water, Plant, and Return to a New Seed

Chapter Twenty-One

Sacred Geometry, the Sri Yantra and Crop Circles

21.1. Geometrical Form as a Map of Process

Throughout the cultural history of humanity, geometrical form has never been merely ornamental. The circle, point, line, triangle, square, spiral, rosette, mandala, star, concentric rings, grid, cruciform structure and polygon may perform decorative, ritual, architectural, mathematical, astronomical, cosmological and philosophical functions. Within the context of the hypothesis of the Unified Matrix of the Universe, however, we are interested in a particular aspect: geometrical form may be regarded as a map of process. It may record not only an external order, but also a sequence of unfolding: from centre to periphery, from point to plane, from simple to complex, from closed to opened, from symmetry to variability, and from one layer to another.

A fundamental boundary must be established from the outset. Forms of sacred geometry should not be used as direct proof of mystical knowledge, an ancient superscience or a concealed universal formula supposedly and deliberately encoded within cultic images. Such an approach would be methodologically weak and would inevitably shift the study into the domain of arbitrary assertions. The geometrical schemes of ancient and traditional cultures may indeed be complex, profound and saturated with meaning, but they cannot automatically be equated with modern theories of morphogenesis, fractality, nonlinear dynamics or cosmology. It is more accurate to regard them as cultural forms for organising space, centre, levels, repetition and transition.

It is precisely in this sense that sacred geometry may be incorporated into the present study. It is significant not because it ‘proves’ the Matrix, but because it demonstrates the persistent tendency of human culture to express the order of the world through geometrical relationships. Human beings create forms in which the centre possesses significance, the boundary organises space, repetition creates rhythm, symmetry preserves wholeness, nesting demonstrates levels, and the movement of the gaze from centre to periphery transforms an immobile image into a processual map. Such geometry is not only an image, but also a mode of thought.

A map of process should be understood here as a scheme in which the spatial arrangement of elements conveys a sequence of becoming. A geometrical map need not depict movement literally. It may be static and inscribed upon stone, paper, fabric, earth, metal, a wall, ritual object or architectural plan. Its structure may nevertheless compel the gaze to move: from a point to a circumference, from an inner square to an outer one, from a central triangle to a system of nested triangles, from small circles to a larger circle, from a closed centre to opened petals, or from a symmetrical axis to a multiplicity of repeated elements. Processuality emerges through this movement of the gaze.

Geometrical form is especially important because it can condense a complex process into a clear scheme. The biological growth of a tree takes years, the opening of a flower takes hours or days, the formation of relief takes millennia, and the development of a cultural tradition takes centuries. Geometry may present comparable relationships instantaneously. It translates the

temporal into the spatial. The centre becomes a beginning. Rings become stages. Rays become directions of opening. Repeated elements become a rhythm of growth. Nested figures become levels. Such a scheme does not replace the actual process, but makes it perceptible as a whole.

In this sense, geometrical form is close to the artefact as a record of a morphogenetic scheme. Chapter 18 examined the artefact as a means of bringing an internal cultural form to the surface. Chapter 19 interpreted the World Tree as a universal model of growth, levels and branching. Chapter 20 interpreted the Sumerian bas-reliefs as possible visual codes of the opening of the grain. Geometrical form now makes it possible to take the next step: to examine not an individual object, tree or bas-relief, but an abstract scheme in which process is expressed through the pure relationships of centre, layer, symmetry, repetition and unfolding.

Geometry differs from naturalistic representation in that it does not copy an object. It identifies an invariant. If a particular flower is depicted, the image will be connected with the plant species, number of petals, shape of the stalk, colour and environment. If a rosette or concentric structure is depicted, what remains of the flower is its principle: centre and radial opening. If a tree is represented naturalistically, its bark, leaves, branches and roots will be important. If it is represented as an axis with branches, its structural idea remains. Geometry purifies form of incidental details and thereby makes it suitable for cultural generalisation.

Such purification also presents a risk. The more abstract the form, the easier it is to attribute excessive meanings to it. The same circle may be the Sun, Moon, grain, eye, centre, heaven, fruit, seal, boundary, perfection, emptiness, completeness or a purely decorative figure. Geometrical analysis must therefore be rigorous. It is impossible to state that a circle always signifies the same thing. A more accurate formulation is that the circle as a form possesses particular morphological properties: centredness, closure, the equal distance of its edge from its centre, wholeness and boundary. Within a particular culture, these properties may be incorporated into different systems of meaning. The task of morphological analysis is not to replace these systems, but to identify the structural function of the form.

The triangle, square, spiral, star, mandala, lotus rosette and complex sacred diagrams should be approached in the same way. Depending upon culture and context, the triangle may signify direction, stability, a summit, triad, ascent, descent, fire, or a feminine or masculine principle. Morphologically, however, it always possesses three vertices, three sides, an orientation and the possibility of pointing upwards or downwards. The square may signify earth, stability, the cardinal directions, spatial order, a foundation or architectural scheme. Morphologically, it expresses equilibrium, boundary, four directions and a stable field. The spiral may signify movement, time, energy, growth, return, a path or vortex. Morphologically, it unites rotation with progressive movement away from the centre. It is precisely such properties that are relevant to the hypothesis of the Matrix.

When considered rigorously, sacred geometry is not a collection of miraculous signs, but a discipline of organised form. It operates with the same features that recur throughout this book: centre, axis, circle, layer, boundary, symmetry, asymmetry, rhythm, repetition, radiality, nesting, transition, active edge, opening and cyclicity. This does not mean that sacred geometry ‘knew’ the Unified Matrix. It means that cultural geometrical schemes frequently employ the same formal invariants found within natural and cultural processes. It is precisely this structural resonance that makes them significant.

One of the central elements of such geometry is the point. The point may be the beginning of a scheme, centre, seed, *bindu*, place of concentration, symbolic source, zero stage or immobile

foundation. Morphologically, the point is the minimal form. It does not yet possess extension, but it already possesses position. It is not opened, but may become the centre of opening. A circumference, ray, axis, triangle, square or spiral may be drawn from a point. The point therefore corresponds to a state of maximum compression of form. Within the A–B–C–D model, it is close to stage A, but is even more abstract than the seed or circle: it is not a shell, but a pure centre of possibility.

The circle is the next important element. It already establishes a boundary. If the point is a centre without space, the circle is a centre with an organised periphery. It defines a region, separates the internal from the external and creates wholeness. In geometrical schemes, the circle frequently represents the first spatial unfolding of the centre. It demonstrates that the centre has not remained an isolated point, but has created a field around itself. In this sense, the circle is a map of primary, but still undifferentiated, opening. It is whole, but does not branch. It is closed, but already contains space. It preserves form while simultaneously creating the possibility of further layers.

The layer emerges when the circle is repeated, when an inner circumference is surrounded by an outer one, when one figure is nested within another, and when the centre begins to unfold through a sequence of boundaries. Concentric circles, mandalas, rosettes, architectural plans, ornamental fields and sacred diagrams are frequently constructed precisely through layers. A layer demonstrates not merely an increase in size, but the presence of stages. The internal does not disappear when the external emerges; it remains the core. The external does not arise separately, but frames and continues the internal. Multilayered geometry is therefore especially close to the idea of morphogenesis: form grows through the addition of levels.

Symmetry is another fundamental principle. It prevents form from disintegrating. Within a symmetrical structure, elements are related to one another around a centre, axis or plane. Symmetry may be radial, mirror, rotational, axial or multiaxial. Within sacred geometry, symmetry frequently creates a sense of order, equilibrium, completeness and internal necessity. Morphologically, however, symmetry is important not only as beauty. It demonstrates that form possesses a law of distribution. Its elements are not arranged randomly, but are governed by a relationship. It is this that makes geometrical form a map of order.

Repetition creates rhythm. If a circle is repeated, rings or chains of circles emerge. If a triangle is repeated, a grid or star-shaped structure arises. If a petal is repeated around a centre, it produces a rosette or lotus. If a line is repeated with rotation, a spiral or undulating rhythm appears. Repetition is one means of transforming a simple form into a complex one. It demonstrates that complexity may be constructed not through the arbitrary addition of details, but through the repeated application of a single principle. In this sense, repetition is related to fractality, although within cultural geometry it frequently becomes more regular and symmetrical.

Unfolding is the process that unites point, circle, layer, symmetry and repetition. Form begins from a centre, acquires a boundary, creates a layer, repeats, becomes more complex, reaches the periphery and creates an edge. Within sacred geometry, this unfolding is frequently perceived as movement from the internal to the external or from the external to the internal. Depending upon the ritual, meditative, architectural or artistic context, the gaze may move outwards from the centre or inwards from the periphery. Both directions are important. Outward movement demonstrates the birth of a complex form from a simple centre. Inward movement demonstrates the return of multiplicity to a single foundation.

It is precisely this bidirectionality that gives geometrical schemes their particular power. They may simultaneously constitute a map of emanation and a map of return. From centre to periphery—opening. From periphery to centre—gathering. From point to complex structure—morphogenesis. From complex structure to point—a path of concentration. This is fundamental to the hypothesis of the Unified Matrix of the Universe: the Matrix should not be understood solely as an expansion of form. It also incorporates the return of form to the centre, seed, new beginning and potentiality. Geometry expresses this with particular clarity: the periphery remains connected with the centre even when the structure is extremely complex.

Forms of sacred geometry frequently use the square as an element of boundary and orientation. The square may represent space, foundation, the cardinal directions, ordered earth, an architectural frame, entrances or limits. Within mandalas and yantras, the square is often connected with an outer enclosure or spatial field within which a more complex structure unfolds. Morphologically, the square differs from the circle: the circle expresses equal propagation from the centre, while the square expresses orientation along four directions and the stable delimitation of a field. When the circle and square are combined, two principles interact: the radial and the orthogonal, the living and the architectural, the centric and the spatially oriented.

The triangle, especially within complex nested structures, makes it possible to represent direction and tension. A triangle may point upwards or downwards, combine with another triangle, and form star-shaped structures, grids, intersections and internal smaller triangles. Within the Sri Yantra, which will be examined in the following section, it is precisely the interaction of triangles that creates a multilayered dynamic structure. Morphologically, the triangle is important because it introduces directionality into a centric scheme. The circle retains the field, while the triangle establishes a tense orientation. Their combination creates a complex map of process.

A star-shaped structure emerges when the centre begins to produce rays or when intersecting figures create multiple vertices. As demonstrated in the chapter on Sumerian bas-reliefs, the star may be read as a sign of radial opening. Within sacred geometry, star-shaped structures are frequently connected with intersecting directions, multiplicity and complex order. Morphologically, the star represents a transition from the closed circle to an active periphery. It demonstrates that the centre is not merely surrounded by a boundary, but also acts outwards through rays, vertices, petals or triangular fields.

The petaloid structure characteristic of lotus mandalas and rosettes is especially important to the connection between geometry and biological form. The petal is not merely a decorative element. It is a sign of opening. When petals repeat around a centre, they create a model of a flower in which biological form has already been transformed into geometrical order. The lotus, which will be examined in Section 21.4, is one of the most powerful examples of this correspondence: a real biological form, a religious-cultural symbol and a morphogenetic scheme of opening are united within a single image.

Crop circles, which will be examined in Section 21.3, occupy a distinctive place within this theme. They cannot be used as proof of extraterrestrial origin, mystical knowledge or an unknown force. A scientifically responsible position requires the factual origin of particular objects to be distinguished from their visual structure. Many crop circles are human creations produced as landscape drawings, artistic interventions, hoaxes or visual experiments. Irrespective of their origin, however, their forms may be considered morphologically: centre, concentric layers, rays,

rotation, chains of circles, petals, edges, symmetry and repetition. In this sense, they are significant as processual diagrams upon the surface of the earth.

Such an approach is especially important to the preservation of scientific integrity. It is unnecessary to prove an unusual origin for crop circles in order to analyse their geometry. A form may be significant even when created by human beings. An artefact is likewise a human creation, but this does not prevent it from being regarded as a record of a morphological scheme. Crop circles constitute a modern or contemporary type of artefact upon the surface of a landscape. They may demonstrate how a geometrical scheme unfolds at the scale of a field: centre, rotation, layers, repeated circumferences, radial elements and spiral transitions. It is precisely this that will be important to the present chapter.

Geometrical form as a map of process possesses another distinctive characteristic: it may be scale-independent. The same principle may be represented upon a small amulet, in the plan of a temple, upon a manuscript page, within an ornament, upon a field, in an architectural composition or within a digital diagram. The scale changes, but the relationships remain. The centre remains a centre. The layer remains a layer. Radiality remains radiality. Repetition remains repetition. This makes geometry particularly suitable for the hypothesis of the Matrix, in which invariant relationships rather than absolute dimensions are important.

In this respect, geometry differs from natural form while simultaneously approaching it. Natural form is constrained by material, environment, energy, growth and time. A geometrical scheme may be purer and more regular. It may therefore sometimes appear to be an ‘ideal’ version of a natural process. A flower in nature is asymmetrical, living, variable and subject to damage. A geometrical rosette may be perfectly symmetrical. A tree in nature is irregular, whereas a tree-like diagram may be rigorous. A river in nature meanders, whereas an undulating ornament may be rhythmical. Geometry does not copy nature, but isolates its formal principle.

The ideality of geometry must not, however, be misleading. The real world is rarely structured according to absolutely regular schemes. The relationship between sacred geometry and the Matrix should therefore be understood not as a literal correspondence with nature, but as a cultural generalisation of natural and cognitive invariants. Geometrical form demonstrates how human beings translate observable order into an abstract scheme. This scheme may be aesthetically perfect, but it remains a model. A model assists thought about a process, but does not replace the process itself.

Three types of geometrical scheme will be of particular significance within this chapter.

The first type is the multilayered centric structure, represented most vividly by the Sri Yantra. Here, the point, nested triangles, intersections, levels, symmetry and movement from the centre towards a complex structure are important.

The second type is the landscape-based processual diagram, represented by crop circles. Here, scale, surface, rotation, concentric layers, chains of circles, radial elements and visual dynamics are important.

The third type is the biocultural model of opening, represented by the lotus. Here, the centre, petals, aquatic environment, symbolism of purity, opening and the transition from biological form to sacred scheme are important.

All three types differ, but they are united by a common morphological language. The Sri Yantra operates through nested triangles and a centre. Crop circles operate through circumferences,

layers, rotations and scale. The lotus operates through petaloid opening and a centric structure. In all three cases, however, centre, repetition, level, symmetry, unfolding and boundary are present. This makes it possible to examine them within a single chapter not as an arbitrary collection of examples of ‘sacred geometry’, but as different cultural forms of processual geometry.

It is especially important that geometrical form can express not only order, but also the transition between different orders. A point becomes a circle; a circle becomes rings; rings become petals or rays; a triangle becomes a system of intersections; a system of intersections becomes a network of small triangles; petals become a mandala; a mandala becomes a path of the gaze from periphery to centre; crop circles become the dynamics of rotation and chains; and the lotus becomes biological opening. Sacred geometry may therefore be understood as a visual grammar of transitions.

This grammar is particularly close to the A–B–C–D model:

- stage A may correspond to a point, centre, seed or closed circle;
- stage B may correspond to the first layer, an opening arc, a triangle, directed movement or the beginning of unfolding;
- stage C may correspond to a complex symmetrical structure, rosette, star, mandala or multilayered yantra;
- stage D may correspond to the external boundary, the return of the gaze to the centre, the repetition of the scheme at a new level or the creation of a new point within a complex structure.

Geometry makes it possible to recognise that A–B–C–D may be not only a biological or cultural process, but also a means of constructing form upon a plane.

The concept of the active edge is also important. Within geometry, the edge is not always passive. A circumference delimits a field, but simultaneously creates the possibility of the next ring. The outer square of a yantra does not simply enclose the structure, but marks the boundary of entry or of the field. The petals of the lotus form the edge of opening. Crop circles particularly emphasise the edge through the contrast between flattened and unflattened surfaces. The star activates the edge through rays. Geometrical form therefore continually treats the boundary as a zone of transition: internal and external, centre and periphery, concealed and manifested, completion and new layer.

Geometry also makes it possible to demonstrate the connection between symmetry and movement. At first sight, a symmetrical form appears immobile. When regarded as a map of process, however, it begins to move. Radial symmetry implies propagation from the centre. Spiral symmetry implies rotation. Concentric circles imply successive expansion or deepening. Nested triangles imply a tense interaction of directions. A rosette implies the opening of petals. Symmetry therefore does not necessarily signify stasis. It may be the trace of organised movement arrested within form.

This proposition is especially important to the analysis of the Sri Yantra. It is frequently perceived as a complete sacred diagram. Morphologically, however, it may be regarded as a multilayered map of movement from a point towards a complex structure and back again. The centre does not disappear within complexity, but sustains it. The triangles do not merely decorate the plane, but create a tense nesting. The layers do not merely frame the centre, but demonstrate a sequence

of levels. The Sri Yantra will therefore be examined not as proof of mystical mathematics, but as one of the most complex examples of centric geometry as process.

The same applies to crop circles. Their visual power is frequently connected not with an individual circle, but with a system: circles create chains, layers, rotational structures, radial flowers, spirals, intersections and grids. Even if such a form is created by human beings over the course of a single night as a landscape drawing, it may be regarded as a map of unfolding. The viewer perceives the centre, followed by the periphery, repetition, direction of rotation and finally the edge. The field becomes the plane of a geometrical process. In this sense, crop circles represent a contemporary form of artefactual geometry in which the earth itself becomes the bearer of a scheme.

Finally, the lotus makes it possible to return geometry to biological form. Unlike a pure diagram, the lotus is a real plant. Culture, however, transforms it into a scheme of opening: centre, petals, layers, aquatic environment, ascent from muddy water to the pure flower, diurnal opening, symmetry and gentle radiality. The lotus demonstrates how a biological form may become sacred geometry without losing its connection with nature. It is therefore especially important to the study as a whole: natural morphogenesis, cultural symbol and geometrical structure coincide within it.

Thus, sacred geometry is regarded not as mystical proof, but as a cultural map of process. Its principal elements—centre, point, circle, layer, symmetry, repetition, triangle, square, star, petal, active edge and nesting—may be read as means of recording morphogenesis upon a plane. Such geometry does not prove the Unified Matrix, but demonstrates that human culture has continually sought to express the becoming of form through stable spatial relationships.

Herein lies its significance to the hypothesis of the Unified Matrix of the Universe. If natural forms demonstrate morphogenesis within matter, and artefacts demonstrate it upon a cultural surface, sacred geometry demonstrates it within an abstract scheme. Here, form is freed from a particular body while retaining its principal relationships: centre and periphery, concealed and opened, level and boundary, repetition and unfolding, symmetry and movement. It is precisely for this reason that the Sri Yantra, crop circles and lotus may be examined within a single chapter: each demonstrates in a different way how geometrical form becomes a map of process.

21.2. The Sri Yantra as a Multilayered Structure

The Sri Yantra is one of the most expressive examples of sacred geometry in which form may be regarded as a multilayered map of process. Within its religious and philosophical tradition, it possesses meanings connected with the Hindu tantric context, the Sri Vidya tradition, divine energy, meditative practice and ritual contemplation. These meanings must not be replaced by a morphological interpretation. The structure of the Sri Yantra is nevertheless so complex, centric and organised into levels that it naturally becomes important material for analysing form as a process of unfolding.

Within this book, the Sri Yantra is examined not as proof of ancient knowledge of the Unified Matrix, but as a cultural geometrical scheme in which several key morphological features may be identified: a central point, nesting, intersection, triangular directionality, multiple levels, radial unfolding, symmetry, lotus bands, an outer boundary and movement of the gaze from centre to

periphery and back again. It is precisely these features that make it possible to analyse the Sri Yantra as a distinctive map of the transition from a simple form to a complex structure.

The first and principal element of the Sri Yantra is the centre. The central point, or *bindu*, may be regarded as the original zone of maximum concentration of form. No unfolded geometry is yet present within it, but the entire scheme appears to gather around it. Morphologically, the *bindu* is close to the seed, growth point, centre of a flower, beginning of a spiral, centre of a circle, core of an artefact or concealed node of a process. It is not merely a decorative point. It establishes the semantic and compositional foundation of the entire structure. Without its centre, the Sri Yantra would become a complex network of triangles, but would lose its internal directionality.

The centre of the Sri Yantra is also important because it remains visible even within immense complexity. The system of triangles, petals, circles and the outer enclosure does not eliminate the centre, but emphasises it. This is fundamental to morphological analysis. The complex form does not become detached from its origin. It unfolds around the centre and preserves its connection with it. In this sense, the Sri Yantra demonstrates one of the principal characteristics of the Matrix: complexity may be multiple while remaining centric. A multiplicity of elements does not necessarily signify chaos; it may be organised around a single original node.

Movement from the *bindu* towards the outer layers may be regarded as a geometrical model of unfolding. First there is the point. A triangular structure then arises around it. Intersections, smaller triangles, levels, lotus bands, circular boundaries and the outer square subsequently emerge. The gaze may move outwards from the centre, perceiving this sequence as an opening in which the point becomes a system. The reverse path is also possible: from the outer enclosure through the lotus bands and triangles back to the central point. The complex structure is then perceived as a path that gathers multiplicity into the centre. It is precisely this bidirectionality that makes the Sri Yantra especially important.

The second key element is the system of triangles. Within the classical structure of the Sri Yantra, intersecting triangles form a complex internal network. The triangle differs from the circle in that it possesses a pronounced directionality. Its vertex points upwards or downwards, while its sides create tension among points. If the circle expresses the uniformity of a field, the triangle introduces a vector into that field. The triangular structure of the Sri Yantra is therefore not a static ornament. It creates a system of directions, intersections and internal tensions.

The interaction of upward- and downward-pointing triangles is especially important. Within the traditional symbolic language, this may be connected with particular divine or cosmological principles. Morphological analysis is primarily concerned with the structural relationship: ascending and descending direction, upward and downward movement, the encounter of opposing vectors and the formation of new small forms at points of intersection. This geometry demonstrates that complexity arises not only through the addition of layers, but also through the interaction of directions. Form becomes complex where lines intersect rather than merely repeat.

The intersections of triangles create small triangular fields. This is especially important: the Sri Yantra does not merely contain several large figures superimposed upon one another. Their intersections generate new elements. A principle close to the morphogenetic emerges here: the interaction of original structures creates derivative structures. Large triangles form small ones. Directions produce a network. The centre becomes surrounded by a multiplicity of secondary forms. This logic recalls natural processes in which simple operations produce complex results: the branching of a tree, venation of a leaf, formation of crystalline patterns, ramification of a river network, opening of a flower or fractal complexification of an edge.

The Sri Yantra is not, however, a natural form in the literal sense. It was created by culture, religious tradition and geometrical thought. It cannot therefore be placed in the same category as a tree or flower as a biological object. It may nevertheless be regarded as a cultural abstraction of principles that manifest themselves in living and material form within nature. Complexity arises within a tree through growth and branching; within the Sri Yantra, through geometrical intersection. Within a flower, it arises through the opening of petals; within the Sri Yantra, through layers, triangles and lotus bands. The mechanisms differ, but the morphological language of centre, opening, repetition and levels is comparable.

The third key element is nesting. The Sri Yantra is constructed as a system of levels in which the external does not destroy the internal, but frames it. The *bindu* lies within. A triangular network surrounds it. Lotus structures appear farther out, followed by the outer square enclosure. Such nesting creates a sense of movement through layers. Each layer possesses its own form, but remains incorporated into the overall system. This recalls the structure of a seed, flower, fruit, planet, artefact or World Tree: an internal core, intermediate shells, an outer boundary and a zone of contact with the environment.

Nesting is especially important to the hypothesis of the Unified Matrix of the Universe because the Matrix is not conceived as a flat figure. It presupposes levels. Every complex form possesses an internal and external, centre and edge, core and shell, concealed and manifested. Within the Sri Yantra, these relationships are expressed geometrically. The centre is surrounded by levels, and each level is not merely ornamental, but part of a path. As the gaze moves through them, it appears to traverse a series of stages: concentration, tension, intersection, opening, framing and boundary.

The lotus bands of the Sri Yantra are especially important to the connection between geometry and biological form. The lotus as a real plant will be examined separately in Section 21.4, but it is already present here as a geometrised motif. Petals arranged around a centre create an image of opening. They mark the transition from a rigorous triangular structure to a softer radial form. If the triangles express tension and intersecting directions, the lotus petals express floral unfolding. They unite sacred geometry with biomorphic logic.

In morphological terms, the lotus layer demonstrates the active edge of opening. The petals point outwards from the centre while retaining rhythm and symmetry. Each petal repeats the general principle while occupying its own place within a circular order. This relates the lotus band to the flower, rosette, radial nebula, star-shaped form and crop circles. In each case, a centre and repeated elements extending towards the periphery are present. Within the Sri Yantra, this principle is incorporated into a complex multilayered structure and consequently acquires particular expressiveness.

The outer square is also significant. It establishes a boundary, field, enclosure, space of entry and external frame. If the inner triangles and lotuses are connected with unfolding, the square is connected with limitation and orientation. It transforms the centric structure into an ordered space. The square enclosure demonstrates that the entire complex geometry does not dissolve indefinitely, but possesses a limit. In this sense, the outer square is analogous to a shell, bark, the stone frame of an artefact, the boundary of a field or an architectural contour. It retains the process within a particular space.

The combination of circle, triangle, lotus and square creates a multidimensional morphological grammar within the Sri Yantra. The circle and centre provide centredness. The triangles provide direction and intersection. The lotus provides opening and rhythm. The square provides boundary

and spatial stability. Different types of formal organisation are united within a single scheme. This makes the Sri Yantra not merely a complex ornament, but a system of relationships. It is precisely for this reason that it is so important to the analysis: it demonstrates how geometry can preserve several levels of process simultaneously.

The symmetry of the Sri Yantra also requires particular attention. Its structure tends towards equilibrium, but this equilibrium is not simple. It arises from the interaction of numerous lines, directions and intersections. Such symmetry differs from simple mirroring. It is constructed as a centric, multiaxial and tension-filled organisation. It contains not only repose, but also internal dynamics. Lines intersect, triangles point in different directions, small forms arise within larger ones, and petals radiate around the centre. Symmetry here is therefore not the absence of movement, but a form of arrested movement.

It is precisely this that allows the Sri Yantra to be regarded as a map of process. At first sight, it is immobile. Read morphologically, however, it demonstrates movement: from point to triangles, from triangles to a multiplicity of smaller forms, from the internal network to the lotus bands, and from these to the outer boundary. The process may be said to be condensed into a geometrical structure within the Sri Yantra. Just as grain contains the future plant in potential form, the central point of the Sri Yantra contains the possibility of the entire scheme. Just as a flower opens through its petals, the scheme opens through its layers. Just as a tree preserves the connection between its branches and root, the yantra preserves the connection between periphery and centre.

It is especially important that the Sri Yantra permits two directions of reading. The first direction is centrifugal: from the *bindu* towards the outer structure. In this case, it may be understood as a model of the unfolding of the world, form, energy or order from an original point. The second direction is centripetal: from the outer boundary towards the *bindu*. In this case, it becomes a model of return, concentration and the gathering of multiplicity into unity. This is highly significant to the hypothesis of the Matrix because morphogenesis is not solely expansion. It incorporates a return to the centre, seed, beginning and new potentiality.

Within the A–B–C–D model, the Sri Yantra may be read structurally rather than literally:

- stage A corresponds to the *bindu* as maximally compressed potentiality;
- stage B corresponds to the initial unfolding of triangular directionality: the centre begins to generate form, while vectors, tension and orientation emerge;
- stage C corresponds to the complex system of intersections, small triangles and lotus layers: form is opened, differentiated and multilayered;
- stage D corresponds to the outer boundary and the reverse path: the complex form acquires a limit, becomes a complete map and may once again be read as a path towards the centre.

Thus, D does not merely close the scheme, but returns the gaze to A.

This interpretation should not be perceived as a traditional explanation of the Sri Yantra. It is specifically a morphological reading within the present study. The traditional symbolism of the Sri Yantra possesses its own terms, levels, deities, ritual meanings and practices. These are not replaced here. Rather, a different level is identified: that of geometrical organisation. At this level, the Sri Yantra demonstrates how a centre may generate a complex, symmetrical, multilayered and internally tension-filled structure. It is precisely this that relates it to the other objects examined within the book.

The Sri Yantra also demonstrates the distinction between mechanical and organic complexity. Formally, it is constructed from straight lines, triangles, circles and squares. It is a rigorous

geometry. Yet it is frequently perceived organically: it resembles a flower, lotus, opening, energy field, complex core or living centre. This combination of rigorous geometry and biomorphic impression is especially important. It demonstrates that culture can translate living processuality into a precise abstract scheme without completely losing the sense of growth and opening.

In this sense, the Sri Yantra acts as a bridge between geometry and morphogenesis. It does not depict a plant, but contains a lotus layer. It does not depict grain, but begins with a point. It does not depict a tree, but possesses a centre, levels and a periphery. It does not depict a temporal process, but compels the gaze to pass through stages. It does not depict a physical Matrix, but demonstrates many of its formal invariants: centre, nesting, intersection, symmetry, repetition, active boundary and return to the beginning.

Particular attention should be paid to the fact that the complexity of the Sri Yantra arises not through a chaotic accumulation of detail, but through the systematic intersection of simple figures. This point is fundamental. Within nature, complex forms frequently arise through the repetition and interaction of relatively simple rules. At the geometrical level, the Sri Yantra demonstrates an analogous logic. Several original triangles create numerous smaller triangles. A single centre organises the entire structure. Repeated petals create a lotus band. The outer square retains the whole. Simple elements united through rigorous relationships produce a high degree of complexity.

This principle may be called a cultural model of the self-organisation of form. The Sri Yantra is not, of course, a physical self-organising system in the scientific sense. It was created by human beings and tradition. As a scheme, however, it demonstrates the idea that complex order may emerge from the interaction of a limited number of fundamental elements. It is this that connects it with the general theme of the study. The Matrix is conceived not as an infinite collection of separate forms, but as a set of relationships capable of generating diversity. The Sri Yantra provides a geometrical image of such generation.

The relationship between the internal and external is also important. The inner zone of the Sri Yantra is dense, tense and complex. Its outer zones are more framing, rhythmical and spatial. This creates a particular dynamic: the maximum concentration of complexity lies near the centre, yet the complete scheme may be read only through its outer layers. A comparable relationship is frequently observed within natural forms: core and shell, centre of growth and periphery, seed and fruit wall, bud and opened petals, trunk and crown. Within the Sri Yantra, this relationship is translated into geometrical language.

If the Sri Yantra is regarded as a map of process, it may be presented as a sequence in which the centre opens. First comes the *bindu* as a point. Next comes the nearest triangular level, at which directionality emerges. This is followed by a system of interpenetrating triangles, within which directions enter into interaction. The lotus bands then appear, as rigorous geometry passes into rhythmical floral opening. Finally comes the outer enclosure, where the process acquires a boundary. This sequence may be represented visually within the chapter's illustration (*Fig. 1*).

The illustration for this section should be approached cautiously. It should not appear to be an arbitrary 'improvement' of the traditional Sri Yantra or a fantastical pseudo-esoteric scheme. It would be preferable to present an analytical version: the central point, nested triangles, lotus layers and outer square boundary, accompanied by subtle visual accents demonstrating movement from centre to periphery. The image should not be overloaded with text. A separate caption may explain that the illustration presents the Sri Yantra as a multilayered structure of centre, triangles, levels and unfolding.

A single image may be used within this section because the Sri Yantra is already a sufficiently complex visual system. It need not be supplemented by numerous diagrams. It is enough to demonstrate the principal levels: the *bindu*, triangular network, lotus band and outer enclosure. Such an illustration will allow the reader to recognise that this is not mystical proof, but a structural analysis of how a point becomes a multilayered geometrical map.

The Sri Yantra is especially important to this chapter because it occupies an intermediate position between abstract geometry and cultural practice. It is neither merely a mathematical drawing nor a natural form. It is a sacred diagram in which geometry, ritual, symbol and contemplation are united. Within the present study, it is significant as an example of the way in which culture constructs a complex map of process from minimal elements: point, line, triangle, circle, petal and square. Such a map may be read as a model of the unfolding of form.

Thus, within a morphological reading, the Sri Yantra appears as a multilayered structure organised around a centre. Its *bindu* corresponds to the maximum concentration of form. Its intersecting triangles create tension among directions and a network of smaller structures. Its lotus layers translate geometry into an image of opening. Its outer square enclosure establishes a limit and spatial field. The entire scheme permits movement from centre to periphery and back again. It is for this reason that the Sri Yantra may be regarded as one of the most complex cultural maps of process: not proof of the Matrix, but an expressive geometrical model of its principal invariants.

21.3. Crop Circles as Processual Diagrams

Crop circles occupy a distinctive place within discussions of sacred and processual geometry. On the one hand, they are frequently surrounded by mythology, speculation, sensational interpretations and attempts to connect them with unknown forces, extraterrestrial civilisations or concealed knowledge. On the other, if the question of their origin is set aside and attention is focused upon the visual structure itself, they constitute exceptionally interesting material for morphological analysis. Crop circles may be regarded as large-scale geometrical diagrams inscribed upon the surface of the earth, in which centre, circumference, layer, rotation, petal, edge, chains of circles and radial construction form complex maps of the opening of form.

Within the present study, it is fundamentally important not to transform crop circles into proof of a mystical or extraterrestrial origin for geometrical schemes. Many such images have been created by human beings as artistic interventions, visual experiments, landscape compositions or deliberate hoaxes. This does not make them uninteresting. On the contrary, it is precisely as human artefacts upon the surface of a landscape that they may be incorporated into the general sequence of cultural records of form. Just as a Sumerian bas-relief recorded process in stone or clay, crop circles record a geometrical process upon a living vegetal surface. The scale and material differ, but not the possibility of a morphological reading.

Crop circles should be analysed not through the question ‘Who created them?’, but through the question ‘How is the form organised?’ If an image contains a central circle, concentric rings, radial elements, spiral transitions, repeated small circumferences, petaloid structures, chains of circles, symmetrical axes or complex peripheral edges, it may be regarded as a processual diagram. Such a diagram does not necessarily depict a particular natural object. It may demonstrate the principle of unfolding itself: from centre to periphery, from one circle to a

multiplicity, from closed form to radial opening, from one layer to another, and from a simple circumference to a complex structure.

The centre is the principal element of most such compositions. It establishes the original point around which the entire image is organised. Even if the composition is asymmetrical or incorporates several centres, one or more nodes from which the construction begins can usually be identified. Morphologically, the centre within crop circles is close to the seed, growth point, *bindu* within a yantra, heart of a flower, centre of a nebula, core of an artefact or initial stage A within the A–B–C–D Matrix. It represents a state of concentration from which opening may begin.

The circumference around the centre creates the first boundary. It separates the internal field from the external. In the simplest case, a circle within a field is already a meaningful form: centre, equal propagation, boundary and closure. Most complex crop circles, however, proceed farther. They add further circumferences, rays, rings, spirals, petals, small circles or peripheral patterns. The initial form consequently begins to unfold. It ceases to be merely a closed circle and becomes a system. It is precisely this that transforms crop circles into processual diagrams.

Concentric layers are especially important. When several circumferences arise around a centre, the form begins to resemble growth through shells. The inner ring becomes the core, while the outer rings become stages of expansion. Such a structure may be compared with the annual rings of a tree, layers of an onion, shells of a planetary body, concentric waves upon water, ring structures within nebulae, mandalas and sacred diagrams. The mechanisms through which they arise differ, but the morphological principle remains the same: the centre generates or organises successive levels. Within crop circles, this principle becomes visible upon the surface of the earth.

The landscape surface makes such geometry especially expressive. Unlike a drawing upon paper or relief carved into stone, crop circles are created through a change in the condition of the vegetation. Some areas are flattened, while others remain standing. The image emerges as a distinction between two states of the field. This is morphologically important: form appears not through the application of pigment, but through a change in the orientation of the living mass of stalks. The field becomes the bearer of the diagram. The boundary between flattened and unflattened areas becomes the active edge of the image. In this sense, crop circles are not only geometrical, but also relief-like and almost corporeal forms.

The edge possesses particular significance within such compositions. Within a crop circle, the edge is the line of transition between an altered and unaltered surface. It appears not as a drawn line, but as a boundary between states. Inside the circle, stalks may lie in one direction; outside it, they remain vertical. Within complex compositions, edges multiply: the edges of rings, petals, small circles, spirals and rays. The entire diagram is consequently constructed through active boundaries. This relates crop circles to themes examined previously: the shell of the seed, opening of the bud, edge of the flower, relief line of the bas-relief, boundary of the artefact and active edge of the nebula.

The motif of rotation is especially interesting. Many crop circles visually create a sense of rotational movement: stalks may be laid in circular, spiral, radial or alternating directions. Even though the form is immobile, the eye perceives it as a trace of movement. The circle becomes not merely a closed figure, but a trajectory. The spiral adds development to rotation: form does not simply follow the circumference, but moves from centre to periphery or from periphery to centre. This is exceptionally important in morphogenetic terms, because rotation and unfolding are frequently connected with the transition of form from a compressed to an expanded state.

Spiral elements within crop circles may be compared with other natural and cultural spirals: shells, galactic arms, vortices in water, the growth of leaves around a stalk, vortex structures within the atmosphere, ornamental spirals and ancient signs of movement. Such a comparison does not, of course, imply an identical origin. It does, however, demonstrate the persistence of the form itself. The spiral connects centre, movement, development and return. It makes it possible to represent process not as a straight line, but as rotational opening. Crop circles containing spiral motifs are therefore especially readily interpreted as maps of process.

Petaloid structures are also highly significant. Some compositions are constructed around the centre like a flower: repeated oval, teardrop-shaped or arc-shaped elements resembling petals are arranged around a circular core. Such a form immediately connects geometry with biological opening. The petal is a sign of the emergence of form from centre to periphery. Repeated petals create radial symmetry. The field is consequently transformed into a gigantic rosette or lotus-like scheme. In this respect, crop circles approach sacred mandalas, rosettes, lotus ornaments and floral models of morphogenesis.

The petaloid structure is particularly important because it makes the transition from circle to flower visible. The original circle represents closed wholeness. The petals disrupt its simple boundary and transform its edge into an opened, rhythmically repeated periphery. This is very close to the transition from stage A to stage C within the A–B–C–D model: the closed form becomes opened, radial and multiple. If intermediate arcs, semicircles or spirals are added, stage B—the transitional phase—also appears. A complex crop circle may therefore be read as a geometrical version of the opening of a bud or flower.

Chains of circles form another type of processual diagram. Within them, form develops not only radially, but also linearly. Small circles may be arranged along a line, arc, spiral, ray or circumference. Such a chain creates a sense of sequence: one circle generates another, the small repeats the large, the centre is transferred, and form moves through a succession of nodes. Morphologically, this resembles a row of seeds, cell division, the nodes of a stalk, phases of the lunar cycle, ornamental rhythm, bubbles in water, planetary orbits or a sequence of stages. The particular meaning depends upon the composition, but structurally a chain of circles is always connected with repetition and transition.

The relationship between large and small circles is important. If a composition contains one large circle and several smaller ones, a hierarchy of scale emerges. The small circles may be satellites, seeds, nodes, phases, secondary centres or repetitions of the principal element. Self-similarity appears here: the circle is repeated at different sizes. Small circles may be arranged around a large one as peripheral elements, form a chain or lie within the larger circle. In every case, they demonstrate that form may generate elements resembling itself. This brings crop circles close to fractal logic, although such fractality most often remains geometrically ordered rather than naturally chaotic.

Crop circles also reveal the relationship between plane and process. A field is a plane, but the image upon it may create a sense of depth, rotation, expansion, pulsation and opening. This is achieved through layers, contrasts among the directions of stalks, sequences of circumferences, radial lines and complex peripheral elements. The flat surface consequently begins to function as a dynamic map. In this sense, crop circles are related to mandalas and yantras: they are static, but the gaze moves across them. The form does not change over time, but contains the trace of possible movement.

It is especially important that such diagrams are created upon the surface of the earth. If the Sri Yantra is ordinarily perceived as a sacred diagram upon a pictorial plane, crop circles are diagrams upon a living landscape. This changes the scale of perception. A person standing within the field may not see the entire structure, but only fragments: flattened stalks, an edge, a direction or arcs. The whole form becomes visible from above. This creates a particular relationship between embodied and panoramic perception. At ground level, the person is situated within the diagram; from above, it becomes visible as a whole. This duality is important to the understanding of landscape geometry.

In this sense, crop circles may be regarded as a modern form of immense artefact. An artefact can usually be held in the hands or examined upon a wall, whereas here the field becomes its medium. The material is vegetal. The instrument is a change in the condition of the stalks. The viewer's experience depends upon distance and height. Such a form simultaneously belongs to the earth, culture and image. This makes crop circles especially interesting to the hypothesis of the Matrix: they demonstrate how a geometrical scheme may be transferred onto the surface of nature and become part of the landscape.

It is precisely here, however, that the methodological boundary must again be emphasised. The form of crop circles may be beautiful, complex and morphologically significant, but this in itself says nothing about an unusual origin. Morphological analysis does not require mystification. If a composition was created by human beings, it may still be important. In creating such forms, human beings intuitively or consciously employ stable geometrical invariants: centre, circle, spiral, petal, symmetry, repetition and similarity across scales. This in itself demonstrates that these invariants possess cultural power. They continue to recur even within contemporary landscape images.

Crop circles are also interesting because they frequently appear as diagrams after the process has already been completed. We observe the result, but may reconstruct a movement of construction: first the centre, then the circumference, followed by radial markings, secondary circles and peripheral elements. Even if the actual construction technique was different, the visual structure compels the image to be perceived as an unfolding. In this respect, crop circles resemble bas-reliefs: the bas-relief is immobile, yet the gaze reads a process within it. The field diagram is likewise immobile, yet its geometry creates an impression of becoming.

This is especially important to the hypothesis of the Unified Matrix of the Universe. The Matrix is regarded not as a single form, but as a system of transitions. Crop circles demonstrate how transitions may be expressed geometrically: a centre becomes a ring; the ring becomes a layer; the layer becomes a petal; the petal is repeated; repetition creates a rosette; the rosette may pass into a spiral; the spiral into a chain of circles; and the chain into a new periphery. Such a sequence is not necessarily present within every composition, but the language of crop circles is frequently constructed through precisely such transitions.

If the A–B–C–D model is applied, the following scheme may be proposed:

- stage A is the central circle or point as closed potentiality;
- stage B is the first expansion: a ring, arc, spiral turn or disruption of simple closure;
- stage C is a complex radial or petaloid structure in which the centre opens into a multiplicity of elements;
- stage D is peripheral circles, chains, repetitions and new centres through which form moves beyond the limits of the original centre and creates the possibility of a new unfolding.

In this sense, D within crop circles may be represented not by a fruit, as in a plant, but by secondary centres capable of beginning a new scheme.

Such an understanding is especially important to distinguishing between biological and geometrical cycles. Within a plant, D is the fruit and seed. Within a geometrical diagram, D is a new centre, ring, circumference or repetition. In both cases, the resulting form returns the process to its beginning. In biology, however, this occurs through the reproduction of a living organism; in geometry, through the repetition of a structural principle. Crop circles may therefore be incorporated into the A–B–C–D Matrix structurally rather than literally. They demonstrate how one geometrical form can generate new centres and new layers.

Crop circles also make it possible to examine the theme of scale. A small scheme drawn upon paper may be transferred to a field and become a space into which a person can enter. This increase in scale changes the experience of form. The centre is no longer merely a point upon a page; it is an area of land. A petal is not a line, but a band of plants. The edge is not a contour, but a corporeal boundary between two states of the stalks. A person may walk along the circumference, stand within the circle, cross a ray and observe the direction in which the plants have been laid. Geometry becomes not only visual, but spatial and embodied. This intensifies its processual character.

In this sense, crop circles may be compared with architecture and ritual space. An architectural plan is likewise geometry into which a human being enters. A mandala may be an object of contemplation, while the plan of a temple may become a space of movement. Crop circles occupy a position between image and space. From above, they appear as diagrams; upon the ground, they become routes, surfaces and transformations of material. They may therefore be regarded as temporary landscape mandalas in which geometry is not only seen, but also experienced through space.

The temporality of crop circles is also important. They exist only briefly. The field grows, changes, is harvested, dries and disappears. The image is not an eternal stone relief. It is temporary, seasonal and connected with the vegetal cycle. This sharply distinguishes it from traditional sacred diagrams that may survive in material form for centuries. From the perspective of morphogenesis, however, this temporality makes crop circles even more interesting. They arise within living material, exist as a brief phase and then disappear together with the agricultural cycle. This makes them not only maps of process, but processual objects in themselves.

Their material—the field—is already connected with grain, growth, water, soil and harvest. A geometrical diagram upon a field therefore inevitably enters into dialogue with agricultural morphology. A circle within a grain field is not merely a circle upon a neutral surface. It is inscribed within a space of growth. The stalks of which the image consists are themselves the products of the germination of grain. Crop circles may therefore be regarded as a secondary cultural geometry superimposed upon a primary biological process. The field is already a morphogenetic environment, while the circles transform that environment into a symbolic diagram.

This brings crop circles close to the Sumerian bas-reliefs of Chapter 20. There, grain, water, plant and reproduction were examined as a cultural scheme of the agricultural process. Here, the field itself is the result of an agricultural process, while geometry appears upon its surface. In both cases, the agricultural environment becomes a bearer of form. The difference is that the Sumerian bas-relief records the process within a durable material, while crop circles record it within temporary vegetal matter. Both forms nevertheless demonstrate that culture continually returns to the themes of grain, field, centre, opening and order.

Crop circles also demonstrate the importance of overview. Their complete form frequently becomes intelligible only from above. This creates an interesting epistemological situation: the structure exists upon the ground, but its wholeness is revealed only through a change in viewpoint. At the level of human height, it is possible to see only a fragment rather than the entire scheme. From above, the whole emerges. This is important to the philosophy of form: wholeness sometimes requires a different scale of observation. The same is true of many natural systems: a leaf vein, river network, delta, urban structure, galactic arm or relief becomes intelligible only at a particular scale of observation.

Crop circles therefore remind us that morphological analysis always depends upon scale. When standing inside a form, it may appear to be a collection of lines and edges. Viewed from above, it becomes a diagram. When compared with other structures, it enters a sequence of centric, radial, spiral and petaloid forms. Such images are therefore especially suitable for a chapter on geometry: they demonstrate how the same form may be embodied, landscape-based, visual, processual and symbolic simultaneously.

The question of symmetry within crop circles is also important. Many compositions possess a high degree of radial or mirror symmetry. Symmetry gives them visual conviction and a sense of order and completeness. In more complex examples, however, symmetry may be combined with asymmetry: one sector differs, a chain of circles shifts, a spiral disrupts uniformity or peripheral elements create dynamics. Such a combination is especially interesting. Complete symmetry creates repose, while a slight disruption of symmetry creates movement. Morphogenesis frequently arises precisely within this tension between order and variation.

Crop circles constructed as mandalas or rosettes demonstrate order. Those constructed as spirals or chains demonstrate movement. Crop circles combining a centre, petals and peripheral nodes demonstrate opening. Those containing repeated small elements demonstrate self-similarity. All these types may be regarded as different forms of processual diagram. They do not necessarily possess the same meaning, but employ a common set of morphological means: centre, radius, arc, layer, repetition, edge, symmetry and scale.

For a more rigorous future analysis, such forms could be classified. The first type would comprise centric-concentric structures: circles and rings around a single centre. The second would comprise radial-petaloid structures: a centre and repeated peripheral elements. The third would comprise spiral-dynamic structures: rotation and displacement. The fourth would comprise chain structures: a sequence of circles or nodes. The fifth would comprise networked or combined structures: intersections among several systems of circles, lines and layers. Such a classification would make it possible to move from general impressions towards comparative morphology.

Morphometrically, crop circles could be analysed through the number of centres, radii, relationships between large and small circles, number of layers, angles among rays, degree of symmetry, recurrence of elements, fractal complexity of the edge, distribution of flattened and unflattened areas, presence of spiral organisation and regularity of chains. Such an analysis would not answer the question of origin, but would make it possible to describe the form rigorously. This is important to the entire hypothesis: if the Matrix is to claim scientific seriousness, it must proceed from beautiful analogies towards parameters, classification and testable features.

The visual illustration for this section may present crop circles as processual diagrams (*Fig. 2*). Rather than depicting a particular famous crop circle, it would be appropriate to create a

generalised analytical composition: a central circle, several concentric layers, a spiral element, a petaloid structure, a chain of small circles and an active edge. The image should make it clear that the field constitutes the surface and geometry the scheme of unfolding. An aerial view would be preferable because it is from above that the entire structure becomes visible. No textual labels are required within the image; a separate caption beneath the illustration may explain its meaning.

Such an illustration is important because it will unite geometry with the surface of the earth. The Sri Yantra demonstrates a sacred multilayered diagram upon a plane. Crop circles demonstrate comparable processual geometry at the scale of a landscape. The lotus, examined below, will return this geometry to biological opening. Together, these three objects form a sequence: abstract diagram—landscape diagram—living form. Crop circles occupy an intermediate position between cultural scheme and natural environment.

Ultimately, crop circles may be regarded as contemporary processual diagrams of the opening of form. Their value to the present study lies not in disputes concerning their origin, but in their morphology. They demonstrate centres, layers, rotation, petals, chains of circles, active edges and repetition across scales. They make geometry embodied and landscape-based. They transform the field into the surface of a sign. They demonstrate how a simple circumference may unfold into a complex system. It is precisely for this reason that they may be incorporated into the hypothesis of the Unified Matrix of the Universe as an example of the cultural-geometrical recording of process: not proof of concealed knowledge, but a visible map of the transition from centre to a complex opened form.

21.4. The Lotus as a Cultural Model of Opening

The lotus occupies a distinctive place among cultural images of form because it unites three levels simultaneously: the actual biological organisation of the plant, a centuries-old symbolic tradition and a clear morphogenetic scheme of opening. Unlike a purely geometrical diagram, the lotus is not merely an abstract figure. It grows in water, takes root in a silty environment, raises its stalk towards the surface and opens its flower above the water. Unlike a simple botanical object, however, it does not remain merely a plant: culture transforms it into a sign of purity, birth, opening, spiritual ascent, centre, light and internal order. The lotus may therefore be regarded as one of the most expressive models of the transition from natural form to sacred geometry.

The lotus is important to this chapter because it connects the Sri Yantra, crop circles and the general idea of geometrical form as a map of process. Within the Sri Yantra, lotus bands form part of a multilayered sacred structure: they frame the internal triangular network and transform rigorous geometry into an image of opening. Within crop circles, petaloid structures resemble gigantic rosettes in which the centre opens through repeated peripheral elements. Within the lotus itself, this scheme is expressed biologically: there is a centre, petals, layers, radiality, symmetry, an aquatic environment, a vertical stalk and the process through which the flower opens. The lotus is thus a living bridge among nature, symbol and geometry.

The first key characteristic of the lotus is its centre. The lotus flower is organised around a central region from which the petals extend. This centre is not an empty point. It is connected with the flower's reproductive structure, the axis of the plant, the point at which the petals gather and the visual core of the entire form. Morphologically, the centre of the lotus is close to the *bindu* of

sacred geometry, the centre of a flower, grain as concealed potentiality, the core of a bas-relief composition and the centre of a crop circle. It establishes the original point around which the radial form unfolds.

The second characteristic is petaloid opening. The petals of the lotus are not arranged chaotically. They form layers, rhythms, circular rows, radial symmetry and a gentle movement from the internal to the external. When closed or partially open, the flower resembles a bud—a form in which the internal structure is still retained by its shell. When opened, the petals extend outwards from the centre, transforming a closed form into an open one. This transition is exceptionally important to the hypothesis of the Unified Matrix of the Universe: the lotus demonstrates not merely completed beauty, but the process through which form opens.

The lotus may be regarded as a biological model of what geometry expresses abstractly. The circle possesses a centre and boundary, but no petals. The star possesses a centre and rays, but no gentle biological layering. The mandala possesses levels and symmetry, but does not grow. Within the lotus, all these features are united within a living process. The flower emerges from the plant, the plant from its root and aquatic environment, and opening occurs through time; the petals possess thickness, form, curvature, colour, direction and rhythm. The lotus is therefore not merely a representation of radiality, but living radiality.

The third characteristic is layering. The petals of the lotus are frequently perceived as nested rows: internal, middle and external. This layering makes the flower resemble a multilayered mandala. The internal does not disappear when the external opens. Every layer remains part of the whole. The outer petals frame the inner ones, while the inner petals preserve their connection with the centre. Morphologically, this is close to the structure of the Sri Yantra, in which the central point, triangles, lotus bands and outer boundary form successive levels. The lotus demonstrates such nesting not as a geometrical abstraction, but as a biological fact of floral form.

The fourth characteristic is radiality. The lotus opens from centre to periphery. This radiality connects it with flowers in general, but within cultural tradition the lotus in particular frequently becomes the model of centric opening. Its form is readily translated into an ornament, rosette, mandala, architectural motif, decorative element, symbolic seat or sacred sign. The reason lies not only in cultural history, but also in the morphology of the flower itself. The lotus is already structured like a scheme: centre, petals, circular rhythm, layer, opening and symmetry. Culture does not invent this structure anew, but intensifies and generalises it.

The fifth characteristic is its connection with an aquatic environment. The lotus grows not upon a dry surface, but in water or a moist, silty environment. Its root and foundation are connected with depth, mud, concealed nourishment and a dark environment. The stalk raises the flower towards light and air. The flower opens above the water. This vertical structure makes the lotus an especially powerful model of transition: concealed foundation — aquatic environment — vertical stalk — opened flower. In this respect, the lotus continues the morphological logic of the World Tree, but in a gentler, aquatic and floral form.

Within the World Tree, root, trunk and crown form a model of levels: subterranean, terrestrial and upper. The lotus likewise possesses levels, but they are expressed differently: the rhizome and foundation within water or mud, the stalk as an axis of ascent, and the flower as opening above the surface. If the tree connects earth and heaven, the lotus connects the depth of water with the light of the opened flower with particular clarity. Its morphology allows culture to recognise an

image of ascent: form emerges from a concealed, turbid and moist environment, but opens as a pure, symmetrical and luminous structure.

It is for this reason that the lotus has become a symbol of purity, spiritual birth, enlightenment, internal opening, cosmic order and the sacred centre within many cultural traditions. These meanings should not be regarded as accidental additions to the plant. They are rooted in the lotus's morphology itself. The plant genuinely rises from water and mud; its flower genuinely opens above the surface; its petals genuinely form a centric harmony. Culture translates this observation into the language of the symbol. The lotus is therefore an example of how a biological form becomes a spiritual and geometrical model.

Methodological caution must nevertheless be preserved. It cannot be claimed that all traditions understand the lotus in the same way. Indian, Buddhist, Egyptian, East Asian and decorative-ornamental lotus symbolism cannot be reduced to a single universal formula. Within every culture, the image of the lotus possesses its own context, texts, rituals, artistic forms and semantic connections. It is nevertheless possible to identify a stable morphological foundation that makes this image especially suitable for cultural use: an aquatic environment, an axis of ascent, centre, petals, layering, opening, the clean surface of the flower and a repeatable radial form.

Identifying this morphological foundation does not negate cultural diversity. On the contrary, it helps to explain why the same vegetal image could acquire profound symbolic significance in different contexts. The lotus did not become a universal symbol merely because people agreed to regard it as sacred. Its form possesses great expressiveness in itself. It is readily connected with ideas of birth, ascent, purification, opening and centre. Culture therefore selects the lotus as an image not arbitrarily, but because its natural morphology already contains a powerful processual scheme.

Within the context of the hypothesis of the Unified Matrix of the Universe, the lotus may be regarded as a model of the transition from the concealed to the opened. At the initial stage, form is connected with depth and water. An axis of ascent—the stalk—then emerges. A bud subsequently forms, within which the flower remains closed. The petals then open. Within the opened flower, centre and periphery become visible simultaneously. Finally, flowering is followed by a reproductive stage connected with seeds and a new cycle. The lotus therefore contains a complete morphogenetic sequence: concealed foundation, axis, bud, opening, centric completeness and seed potentiality.

This sequence may be compared with the A–B–C–D Matrix. Stage A is the concealed foundation, seed, rhizome and potentiality within the aquatic environment. Stage B is the ascent of the stalk and formation of the bud, when form is already directed towards opening but has not yet opened completely. Stage C is the opened flower with its radial petals, layers and visible centre. Stage D is the seed or fruiting stage, in which the opened form returns to a new potentiality. Within the lotus, this scheme is especially clear because it unites vertical movement, radial opening and cyclical reproduction.

The lotus is also important because it unites two geometries: the vertical and the radial. Vertical geometry is connected with the stalk, ascent from water and the axis of growth. Radial geometry is connected with the opening of the flower. Line and circle, axis and rosette, ascent and opening are united within a single plant. This makes the lotus an especially powerful model of morphogenesis. The staff within the Sumerian bas-relief was an axis. The circle, crescent and star demonstrated stages of opening. The World Tree demonstrated verticality and branching. The Sri

Yantra demonstrated centre and multilayered geometry. The lotus unites these motifs within a biocultural form.

The relationship between the lotus and the circle is especially interesting. Viewed from above, an opened flower is frequently perceived as a circular or almost circular structure. This circle, however, is neither smooth nor closed. Its edge consists of petals. The lotus therefore demonstrates the transition from a simple circumference to an active petaloid edge. In this sense, it is a living analogue of geometrical schemes in which the circle becomes a rosette or mandala. The circle preserves wholeness, while the petals open it. The lotus thus demonstrates that completeness and openness may coexist.

The active edge of the lotus possesses particular significance. The petals form the boundary of the flower, but this boundary is neither rigid nor passive. It is soft, layered, opening and sensitive to light and time. Within the closed bud, the edge retains the internal. Within the opened flower, it becomes a zone in which beauty is manifested and interaction with the environment occurs. This logic corresponds to the general theme of the study: the boundary of form does not merely separate the internal from the external, but participates in the process. The seed coat opens, the edge of the flower unfolds, the edge of the nebula demonstrates an active region of interaction, the edge of the artefact records a sign, and the edge of a crop circle separates an altered surface from an unaltered one.

The lotus is also connected with the concept of purity not only symbolically, but morphologically. The flower rises above the water, separating itself from the turbid environment from which it receives nourishment. Visible opening does not negate its concealed foundation, but transforms it. This makes the lotus a powerful model of transformation: a light and symmetrical form emerges from a dark and moist foundation. Within cultural language, this readily becomes an image of spiritual purification or internal opening. Within morphological language, it may be described as the transition from a concealed environment of nourishment to the manifested structure of the flower.

The mud and flower should not, however, be opposed too crudely. The lotus could not exist without its aquatic and silty environment. Its beauty arises not in spite of its foundation, but because of it. This is an important proposition for the hypothesis of the Matrix. An opened form must not reject its concealed foundation. The flower remains connected with root and water. The crown of a tree remains connected with its roots. The artefact remains connected with material and tradition. The geometrical mandala remains connected with its centre and outer boundary. Every manifested form is nourished by a concealed level. The lotus demonstrates this with particular clarity: the pure flower and turbid water belong to a single system of growth.

Lotus symbolism is also closely connected with the seat, foundation or throne. In many images, divine, spiritual or enlightened figures are placed upon a lotus or within a lotus structure. Morphologically, this means that the opened flower becomes a foundation for a higher image. The lotus not only grows, but also bears a meaningful figure. It becomes a platform for the opened centre. In this respect, the lotus approaches the mandala: it is not merely depicted, but organises sacred space around a centre.

This aspect is important to the present study because the lotus demonstrates how a biological form may become an architecture of meaning. The petals create not only a flower, but also a space. The centre of the flower becomes a place. The rhythm of the petals becomes a boundary. Floral form becomes a model for the positioning of a figure, deity, idea, consciousness or sacred centre. This once again demonstrates that culture frequently transforms natural morphology into

a scheme of space. The lotus becomes not only an image of opening, but also a spatial organisation.

A comparison between the lotus and the Sri Yantra reveals an important distinction. The Sri Yantra constructs lotus levels geometrically: the petals become part of a diagram. The lotus as a plant constructs geometry biologically: its petals grow as organs of the flower. In the first case, a biological image is transformed into a sacred scheme. In the second, the scheme is already present within living form. This distinction is important to understanding the transition from nature to culture. Culture does not merely copy the lotus; it extracts its geometrical principle and incorporates it into more complex diagrams.

The lotus is connected with crop circles through petaloid radiality. Many landscape diagrams are constructed as gigantic flowers: a central circle surrounded by repeated peripheral elements. Even if such images bear no direct relationship to the lotus, they employ the same principle morphologically: the centre opens through a sequence of repeated petals. The lotus helps explain why such a structure is perceived as processual and harmonious. It recalls biological opening even when rendered in purely geometrical form. The lotus therefore provides a key to reading many centric forms.

The lotus may also be compared with the Sumerian scheme of circle, crescent and star. The lotus bud is close to a closed form. A partially opened flower resembles a transitional phase in which the petals are still held together, but have already begun to open. The fully opened lotus approaches a radial star-shaped or rosette form. Following flowering, a seed stage emerges and returns the process to new potentiality. The lotus thereby provides a natural-cultural version of the same sequence: the closed—the opening—the opened—the reproducing. It is precisely the recurrence of this scheme that makes the lotus important to the hypothesis.

Biologically, the lotus possesses a particular morphology connected with its aquatic environment and the characteristics of its leaves, flower, rhizome, seeds and life cycle. Within the present chapter, however, biological details are important not in themselves, but as the foundation of cultural form. The concern is not a botanical description of the species, but why the lotus became such a powerful model of opening. The answer lies in its visible structure: the flower emerges from water, rises upon a stalk, opens in layers of petals around a centre, creates radial symmetry and returns the process to seed potentiality. This is sufficient for culture to recognise within it an image of becoming.

The lotus as a cultural model of opening also demonstrates the relationship between beauty and regularity. Its beauty is not arbitrary. It is connected with the order of the petals, gentle symmetry, layering, centre and rhythm. It is precisely for this reason that the lotus is readily geometrised. It may be transformed into an ornament, mandala, architectural motif, throne design or symbolic sign. The beauty of the lotus is compelling because it carries a legible order. This is important to the hypothesis of the Matrix: form may be perceived as beautiful precisely when an internal regularity of opening can be sensed within it.

The lotus is not, however, a perfectly mechanical figure. Its petals may exhibit variability, living deviation, gentle asymmetry and individual curvature. This distinguishes it from a rigorous geometrical rosette. Within the living lotus, order and variation coexist. A geometrical scheme may idealise the flower, but the real plant always differs slightly from that scheme. This makes the lotus especially important to the understanding of the Matrix: a universal invariant does not destroy individuality. Centre, petals, layers and radiality recur, but every flower opens in its own way.

This combination of invariant and variability has already appeared repeatedly throughout the book. A tree possesses a general algorithm of branching, but every tree is unique. A leaf possesses venation, but each leaf has its own variations. Relief possesses lines of tension and erosion, but every landscape is singular. An artefact employs persistent signs, but every monument possesses its own history. The lotus continues this sequence. It demonstrates that a morphogenetic scheme is not a rigid template, but a principle manifested through living variation.

The lotus also makes it possible to refine the concept of sacred geometry. Sacred geometry is frequently perceived as a domain of abstract schemes, but the lotus demonstrates that its roots may be biomorphic. Geometry does not always arise from pure mathematics. It may emerge from the observation of living forms—from the flower, leaf, seed, tree, water wave, starry sky or rhythm of the body. Culture then purifies, repeats and symmetrises these forms, inscribes them within circles and squares, and transforms them into diagrams. The lotus is one of the clearest examples of this transition from the living to the geometrical.

The visual illustration for this section should present the lotus as a cultural model of opening (*Fig. 3*). It would be preferable to show not merely a beautiful flower, but an analytical scheme: the lower aquatic level, concealed foundation or rhizome, vertical stalk, closed bud or indication of the initial form, opened flower with its centre and layers of petals, and the seed or fruiting region as the return of the cycle. The image should unite biological form with geometrical clarity. Subtle circular or radial guides may be included, but without textual labels within the image. A separate caption may explain that the lotus is being examined as a model of concealed foundation, axial ascent, petaloid opening and return to the seed.

Such an illustration is important not only to this section, but also to the entire chapter. The Sri Yantra presents sacred geometry as a multilayered diagram. Crop circles present geometry as a landscape-based processual scheme. The lotus demonstrates that comparable geometry may be rooted within a living form. It completes the chapter by returning abstraction to nature. Following the analysis of points, triangles, circles, layers, field diagrams and mandalas, the reader once again encounters a living flower in which all these features become natural: centre, symmetry, layer, opening, edge, axis, environment and cycle.

In this respect, the lotus is not merely an object of symbolism, but also the methodological conclusion of the chapter. It demonstrates that sacred geometry should not be regarded as a system of mystical figures detached from the world. It may be understood as a cultural means of identifying relationships already present within nature: centre, opening, layering, repetition, rhythm, symmetry and boundary. The lotus demonstrates this with particular force because it is itself a natural form that is perceived almost immediately as a geometrical diagram.

Thus, the lotus as a cultural model of opening unites biological, symbolic and morphogenetic perspectives. Biologically, it grows from an aquatic environment, rises upon a stalk and opens its flower. Symbolically, it is connected with purity, birth, spiritual opening, centre and sacred completeness. Morphogenetically, it demonstrates the transition from a concealed foundation to an axis, from bud to opened flower, from centre to petals, and from flowering to seed potentiality. It is precisely this threefold structure that makes the lotus one of the key images of the chapter.

The lotus is important to the hypothesis of the Unified Matrix of the Universe because it demonstrates how the same formal algorithm may manifest itself at different levels. Within nature, it appears as the growth of an aquatic plant. Within culture, as a sacred symbol. Within geometry, as a rosette, mandala or lotus band of a yantra. Within the philosophy of form, as a

scheme of concealed, axial, opened and reproducing states. The lotus may therefore be regarded as one of the most precise images of the Matrix at the cultural-geometrical level: not proof of a universal law, but a living and symbolically rich model of its possible invariants.

Thus, sacred geometry, the Sri Yantra, crop circles and the lotus should be regarded not as a collection of mystical enigmas, but as different forms of processual geometry. The Sri Yantra demonstrates a multilayered structure of centre, triangles, lotus levels and outer boundary. Crop circles demonstrate the landscape-based unfolding of centres, layers, rotation, petals and chains of circles. The lotus demonstrates living opening in which biological form becomes a cultural and geometrical model. All these forms differ in origin and function, but converge upon one essential feature: they record movement from centre to complex structure, from concealed to manifested, from closed to opened, and from opening to a new cycle.

21.5. Caution in Interpretation

The sacred and cultural forms examined in this chapter require particular interpretative caution. The Sri Yantra, crop circles, lotus schemes, mandalas, rosettes, concentric structures and other geometrical images cannot be regarded as laboratory proof of the hypothesis of the Unified Matrix of the Universe. They are not experimental data in the scientific sense, cannot directly confirm a universal law of form generation and should not be used to argue that ‘ancient cultures already understood modern morphogenesis’. Such a claim would be methodologically incorrect and would weaken the entire research framework.

The principal purpose of this chapter is not proof, but comparative-morphological and philosophical-hermeneutic analysis. Forms of sacred geometry are significant because they record persistent modes of organising form: centre, axis, circle, layer, nesting, symmetry, repetition, radiality, petaloid opening, active edge and return to the centre. These features may be compared with the natural, biological, geological, cosmic and cultural structures examined earlier in the book. Comparability, however, is not identity. If a centric and multilayered organisation is found within the Sri Yantra, lotus or crop circle, this does not mean that they possess the same mechanism of origin. It means only that, at the level of form, they demonstrate similar invariants.

It is here that the important boundary between scientifically permissible analysis and arbitrary mystification lies. It is permissible to state that the Sri Yantra may be regarded as a multilayered structure in which a central point, triangles, lotus levels and an outer boundary form a map of the unfolding of form. It is impermissible to claim that the Sri Yantra ‘proves’ the existence of the Unified Matrix as a physical law. It is permissible to examine crop circles as processual diagrams of centres, layers, rotation, petals and chains of circles. It is impermissible to use their geometry as proof of an extraterrestrial or supernatural origin without independent, verifiable evidence. It is permissible to analyse the lotus as a cultural model of opening. It is impermissible to reduce all the religious and cultural meanings of the lotus to a single universal scheme.

Sacred geometry belongs primarily to cultural, symbolic and ritual space. It arises within traditions in which form is connected with practice, contemplation, myth, architecture, embodied experience, the calendar, ritual, cosmology and artistic convention. Every morphological interpretation must therefore respect its historical context. A figure cannot be extracted from its tradition and transformed solely into a scheme of the Matrix. It is more accurate

to say that a structural level permitting comparative analysis may be identified within a cultural form. This level does not negate the religious, artistic or historical meaning, but is added as another layer of interpretation.

Such an approach may be called the philosophical hermeneutics of form. It does not claim laboratory verification, but makes it possible to read cultural images meaningfully as bearers of concepts of order, centre, level, opening and the relationship among parts. Hermeneutics here signifies not unrestrained fantasy, but disciplined interpretation. The researcher must distinguish description from interpretation. Description records what is visible: circle, centre, triangles, petals, layers, outer boundary and repeated elements. Interpretation proposes a possible meaning: the unfolding of form, movement from centre to periphery, return to the centre, a model of opening or a scheme of a cycle. The more clearly these levels are distinguished, the more reliable the analysis becomes.

It is especially important to distinguish three types of claim. The first is a factual claim: the image contains particular elements, such as a central point, nested triangles, circles, petals or an outer frame. The second is a morphological claim: these elements form a centric, radial, layered or processual structure. The third is a philosophical claim: such a structure may be compared with the hypothesis of the Unified Matrix as one of the cultural images of the unfolding of form. Error arises when the philosophical claim is presented as fact or when morphological similarity is declared to be direct proof. This substitution must be consistently avoided throughout the present book.

Comparative morphology operates differently. It does not ask whether the Sri Yantra, lotus and crop circles are the same phenomenon. They are clearly different phenomena. The Sri Yantra belongs to a religious-geometrical tradition, crop circles to a landscape-based and frequently contemporary visual practice, and the lotus to biological and cultural-symbolic form. Comparative morphology instead asks which formal features recur within these different phenomena. Is there a centre? Are there layers? Is radiality present? Is there a transition from closed to opened? Is there an active edge? Are elements repeated? Is there a relationship between the internal and external? It is at this level that a valid comparison becomes possible.

Such comparison possesses scholarly value not as proof of a universal law, but as material for constructing a typology of forms. It is possible to identify centric, radial, spiral, lotus-like, layered, networked, axial and cyclical schemes. These may then be compared according to where and how they arise: within plants, artefacts, bas-reliefs, mandalas, field diagrams, architecture, relief and natural structures. Such an approach gradually moves the hypothesis from the domain of figurative analogies into that of systematic morphological research. This, however, requires constant caution in language.

Instead of categorical formulations, precise expressions should be used: ‘may be regarded as’, ‘permits a morphological reading’, ‘is structurally comparable’, ‘demonstrates similar features’, ‘may provide material for comparative analysis’ and ‘permits interpretation at the philosophical-hermeneutic level’. Such formulations do not weaken the text, but make it scientifically robust. They demonstrate that the author distinguishes hypothesis, interpretation and proof. This is especially important if the hypothesis is to be taken seriously.

Sacred forms also require respect for cultural autonomy. They cannot be regarded merely as ‘illustrations’ of a modern authorial concept. Each possesses its own history. The Sri Yantra is connected with a particular tradition, practice and system of meanings. The lotus possesses different meanings within different cultural and religious contexts. Crop circles have their own

history of reception, production, mystification and artistic use. If all these forms are simply declared manifestations of one Matrix, the analysis becomes reductionist. A more accurate approach is to demonstrate that they preserve their cultural independence while simultaneously participating in a broader comparative discussion of form.

This is especially important because the material may easily be misunderstood. The terms ‘sacred geometry’, ‘Sri Yantra’ and ‘crop circles’ frequently create an expectation of mystical conclusions. This book, however, must proceed in a different direction. It does not mystify geometry, but analyses it. It does not assert a supernatural origin for forms, but examines their structure. It does not replace the study of religion, history or art history, but adds a morphological and philosophical layer. This makes it possible to preserve a balance between the boldness of the hypothesis and the responsibility of the research.

Within the hypothesis of the Unified Matrix of the Universe, sacred and cultural forms perform a particular role. They demonstrate not a physical mechanism, but a cultural intuition of form. In creating geometrical schemes, human consciousness frequently returns to the same relationships: centre and periphery, internal and external, layer and boundary, point and unfolded structure, symmetry and movement, closure and opening. These relationships are not arbitrary. They are deeply rooted in the human experience of perceiving the world, body, plants, celestial cycles, water, growth, architecture, ritual and image. Sacred geometry may therefore provide important cultural material for the hypothesis, but not its definitive proof.

In other words, sacred geometry demonstrates how human beings conceive form. Nature demonstrates how form arises within matter. Culture demonstrates how form is recognised, symbolised and transmitted. A connection exists among these levels, but it is not one of direct identity. The Sri Yantra is not ‘equivalent’ to a flower, a crop circle is not ‘equivalent’ to a galaxy, and the lotus does not ‘prove’ the universal Matrix. All of them may nevertheless be regarded as different expressions of centre, layer, radiality, opening and repetition. It is precisely such comparative work that allows the hypothesis to proceed without sacrificing scientific caution.

Philosophical hermeneutics is especially important here because cultural forms cannot be measured in the same way as physical objects. It is possible to measure the radii of circles, number of petals, angles of triangles, degree of symmetry, number of layers and relationship between centre and periphery. The meaning of a form, however, always extends beyond numbers. It is connected with culture, tradition, perception, ritual, memory, symbol and interpretation. The analysis of sacred forms must therefore combine morphological description with hermeneutic caution. Only in this way can two extremes be avoided: a dry formalism that fails to perceive meaning and a mystical arbitrariness that recognises no boundaries.

Comparative morphology and philosophical hermeneutics complement one another. The former keeps form within the domain of observable features: centre, axis, layer, repetition, symmetry and edge. The latter makes it possible to understand why these features became culturally significant. Morphologically, for example, the lotus is an aquatic plant with a radially opening flower. Hermeneutically, it becomes an image of purity, ascent and spiritual opening. Morphologically, the Sri Yantra is a multilayered centric structure. Hermeneutically, it is connected with contemplative practice and sacred order. Morphologically, crop circles are landscape-based geometrical diagrams. Hermeneutically, they become objects of modern mythmaking, artistic gesture and visual wonder. Both perspectives are necessary.

The further development of the hypothesis requires the proposal of a possible method for testing cultural-morphological observations. This would not be laboratory testing in a strictly physical

sense, but it could be systematic. A corpus of images would need to be assembled: yantras, mandalas, lotus rosettes, sacred plans, crop circles, ancient ornaments, bas-reliefs and architectural schemes. They could then be described according to a unified set of features: the presence of a centre, number of layers, type of symmetry, character of the boundary, radiality, spiral organisation, nesting, repetition, connection with vegetal form, presence of an axis and presence of a cyclical motif. Frequencies, types, combinations and persistent configurations could subsequently be compared. Such an approach would not definitively prove the Matrix, but would make comparative morphology more rigorous.

It is in this direction that sacred forms may become serious research material. They should not remain merely illustrations. They may be catalogued, classified, compared and analysed both morphometrically and hermeneutically. It would then become possible to distinguish strong from weak analogies. A strong analogy presupposes the correspondence of several features: centre, levels, radiality, active edge and processual sequence. A weak analogy is based solely upon a general external resemblance. Such a criterion is necessary if the hypothesis is not to dissolve into an infinite series of unconstrained comparisons.

In this sense, the present chapter performs both an expansive and a limiting function. It expands the scope of the hypothesis by incorporating sacred geometry, the Sri Yantra, crop circles and the lotus. At the same time, it limits the manner in which this material may be used. These forms cannot be declared proof. They may be used as examples of cultural records of morphological invariants. They make it possible to recognise that, at different stages of history and in different cultural situations, human beings created schemes of centre, layer, symmetry and opening. Definitive conclusions, however, require further work: comparison, classification, interdisciplinary analysis and cautious language.

The conclusion of this chapter must therefore be formulated with the utmost clarity. Sacred and cultural forms are not laboratory proof of the hypothesis of the Unified Matrix of the Universe. They do not confirm it in the way that an experiment confirms a physical relationship. They may, however, provide valuable material for comparative morphology and philosophical hermeneutics. They demonstrate how culture constructs images of process, how the centre becomes a structure, how the layer becomes a map, how symmetry retains movement, how lotus-like opening unites nature and sign, and how geometry makes the idea of becoming visible.

Thus, caution in interpretation does not weaken the hypothesis, but makes it more serious. The more precisely fact, form, symbol and philosophical conclusion are distinguished, the more reliable the study becomes. The hypothesis of the Unified Matrix of the Universe may engage with sacred geometry only if it acknowledges the limits of such engagement. The Sri Yantra, crop circles and lotus do not prove the Matrix, but they make it possible to recognise that the ideas of centre, layer, opening and return to the beginning are deeply present within cultural forms. This is why they occupy an important place within the book: not as definitive arguments, but as cultural evidence of the persistent human aspiration to conceive the world through form, order and process.

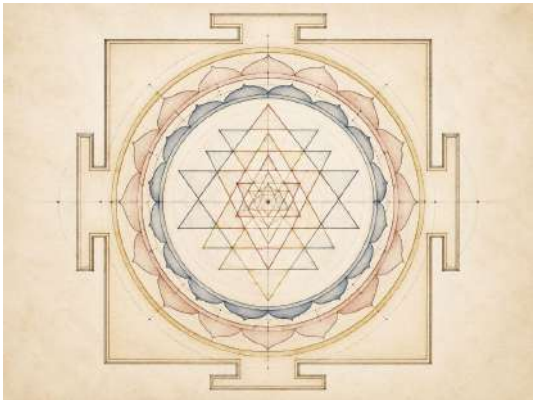

Fig. 1. Sri Yantra as a Multilayered Structure: Central Point, Nested Triangles, Lotus Levels, and Outer Boundary as a Map of the Unfolding of Form

Fig. 2. Crop Circles as Processual Diagrams: Centre, Concentric Layers, Rotation, Petal-Like Unfolding, Chains of Circles, and the Active Margin of Form

Fig. 3. Lotus as a Cultural Model of Unfolding: Aquatic Environment, Hidden Foundation, Axial Ascent, Centre, Layers of Petals, and Return to Seed Potentiality

Part Seven

Methodology for Testing the Hypothesis

Chapter Twenty-Two

What Can Be Tested Scientifically

22.1. Testable and Untestable Propositions

Following the examination of natural, cultural and sacred-geometrical forms, it is necessary to address one of the principal methodological questions of the entire study: what exactly within the hypothesis of the Unified Matrix of the Universe can be tested scientifically, and what belongs to the domain of philosophical interpretation, figurative language and heuristic modelling? Without such a distinction, the hypothesis risks becoming excessively broad: it will simultaneously address plant morphology, relief, nebulae, artefacts, the World Tree, Sumerian bas-reliefs, the Sri Yantra, the lotus and crop circles without making clear which of these propositions can be tested and which should be regarded as semantic and philosophical generalisations. This chapter must therefore establish a rigorous boundary among the testable, the interpretable and the metaphorical.

This distinction does not weaken the hypothesis, but makes it more serious. Every major theoretical construction requires different levels of assertion to be distinguished. It is one thing to state that similar morphological features recur within different natural systems: centre, axis, branching, layering, radiality, fractality and active edge. Such a proposition can be tested. It is another to state that these features express the Unified Matrix of the Universe. This is already a philosophical interpretation requiring cautious language. It is yet another to speak of the ‘grain of the world’, ‘cosmic tree’, ‘opening of the Universe’ or ‘flower of form’. These are figurative formulations that may be expressive and heuristically useful, but do not constitute scientific proof.

The first group consists of testable propositions. These are connected with features that can be observed, described, measured, compared and analysed statistically. Such propositions include the presence of recurring morphological characteristics within objects belonging to different levels: biological, geological, hydrogeomorphological, cosmic and cultural-artefactual. For example, it is possible to test whether centric structures, radial forms, branching, nested layers, repeated contours, spiral elements, active edges, axial organisations or self-similar structures occur frequently within a selected corpus of images. This is no longer a question of taste, but one of classification and counting.

Fractal dimension is also testable. If it is claimed that certain forms—leaf venation, river networks, roots, tree crowns, cracks, coastlines, cloud structures, nebulae or cosmic filaments—demonstrate complexity across scales and self-similarity, this may be investigated quantitatively. Methods may include box-counting, analysis of how measured length or area depends upon scale, comparison of fractal dimensions, assessment of scale invariance, and analysis of the distribution of branches and nodes. The results may confirm, refine or refute the assumption that the forms possess comparable types of complexity.

Symmetry is likewise testable. The degree of radial, bilateral, axial, rotational or approximate symmetry may be measured within different objects. The symmetry of a flower, shell, snowflake, rosette, artefact, crop circle, nebula or galactic structure may be compared. Their mechanisms of formation are, of course, different, and this must be emphasised continually. Symmetry itself, however, can be measured as a geometrical characteristic: through deviations from an ideal form, the angular distribution of elements, repetition among sectors, correlation between two halves and uniformity of radial directions. The proposition that symmetrical schemes recur is therefore open to testing.

Patterns of branching are testable. If the study asserts that a tree, leaf, root system, river network, vascular system, lightning bolt, crack, delta, mycelium or cosmic filamentary structure may be compared through the principle of branching, this must be translated into measurable parameters. The number and order of branches, branching angles, segment lengths, ratio between the thickness of the trunk or channel and its lateral branches, node density, degree of hierarchy and scale distribution may all be calculated. Comparison then ceases to be merely visual and becomes morphometric.

Edge parameters are also testable. Previous chapters repeatedly emphasised the role of the active edge: the edge of a leaf, petal, nebula, relief fault, coastline, artefactual surface, crop circle, seed coat or bud. The ‘active edge’, however, must be translated into parameters: curvature, roughness, fractal dimension of the contour, presence of repeated projections, degree of sinuosity, contrast between internal and external zones, distribution of minor irregularities and the ratio of edge length to the area of the form. Such parameters may be measured and compared. The proposition concerning the complexity of the edge may therefore also become an object of scientific testing.

Structural correlations are testable. Rather than merely recording individual characteristics, it is possible to test whether they are related to one another. For example, do radial structures more frequently possess a pronounced centre? Is a high fractal dimension of the edge associated with branching? Is layering accompanied by an active periphery? Do centric forms occur more often among biological and cultural objects than among randomly selected geological ones? Is there a statistically significant difference between natural and artefactual structures in the number of levels, degree of symmetry or repetition of elements? Such questions require an image database, formalised annotation and statistical analysis, but it is precisely questions of this kind that transform the hypothesis into a testable research programme.

The classification of morphological types may also be included among the testable propositions. It is possible, for example, to distinguish radial-layered forms, axial-network forms, spiral forms, branching forms, closed forms of tension, lotus-like or rosette forms, shell-like forms, filamentary structures and relief-edge structures. It is then possible to test how consistently these types occur within different sets of objects. If the classification works only with a few carefully selected illustrations, its significance is limited. If it can be applied to a large corpus of images and produces reproducible results, the hypothesis acquires a more substantial foundation.

The second group consists of philosophical propositions. These are not testable in the same sense as fractal dimension or degree of symmetry. They include the question of the meaning of the Matrix. What is the Unified Matrix of the Universe? Is it a real ontological principle, a metaphor for the universal organisation of form, a philosophical model, a heuristic instrument or a means of describing recurring invariants? This question cannot be answered solely by measuring the

contour of a leaf or galaxy. It requires philosophical work: clarification of concepts, boundaries and the status of the hypothesis, and examination of the relationships among form, matter, process and meaning.

The proposition concerning the universality of form is also philosophical. Similar features may be measured within different objects, but the transition from ‘similar features recur’ to ‘a universal principle of form exists’ is already an interpretation. It may be more or less convincing, but it is not the direct result of a single measurement. Scientific data may support this interpretation, restrict it or require its revision, but cannot replace the philosophical conclusion. The text must therefore distinguish between the following: the data demonstrate the recurrence of features; the hypothesis proposes that this recurrence be regarded as a manifestation of a more general principle.

The question of the relationship between nature and symbol is likewise philosophical. It has repeatedly been argued above that cultural forms—the World Tree, bas-relief, Sri Yantra, lotus, ornament and sacred geometry—may be compared with natural morphological invariants. The connection between natural form and cultural symbol, however, is not a simple physical relationship. Culture does not copy nature mechanically. It observes, selects, intensifies, abstracts, ritualises, stylises and transmits forms. The question of how natural morphology becomes symbol therefore belongs to philosophical hermeneutics, cultural studies, anthropology and the theory of images. It cannot be resolved solely by counting petals or radii.

The question of why particular forms are perceived by human beings as significant, beautiful, sacred or universal is also philosophical. The centre, circle, symmetry, spiral, lotus, tree, star, wave and zigzag possess immense cultural persistence. Explaining this persistence requires not only morphometry, but also analysis of perception, embodied experience, ritual, memory, myth, aesthetics, cognitive schemes and historical traditions. Science may investigate individual aspects of this question, but philosophical generalisation remains necessary.

The third group consists of figurative propositions. These are especially important to the language of the study, but must be clearly distinguished from scientific statements. When the text speaks of the ‘grain of form’, ‘opening of the world’, ‘flower of the Universe’, ‘cosmic tree’, ‘breath of the Matrix’, ‘memory of stone’, ‘active edge of life’ or ‘petals of the Universe’, it employs metaphorical language. Such language helps to make complex ideas visible, connect different levels of material, preserve the wholeness of the study and convey the intuitive power of the hypothesis. Metaphor, however, is not proof. It may direct thought, but cannot replace testing.

The image of the grain, for example, is exceptionally productive. Grain genuinely is a closed potential form capable, under particular conditions, of opening, germinating, producing a plant and generating new grain. It is therefore suitable for explaining the A–B–C–D model. When grain is used as an image of the Universe, culture or Matrix, however, it passes from biological description into philosophical metaphor. This is permissible if the reader understands the level of discourse. It is impermissible to present the metaphor as a physical identity. The world is not literally a grain, but grain may serve as a model of concealed potentiality and cyclical opening.

The same applies to the image of the flower. A flower genuinely opens and possesses a centre, petals, layers, radiality, an active edge and a temporary flowering phase. It may therefore be used as a model of the opening of form. If the text speaks of the ‘flower of a galaxy’ or the ‘flower of the Matrix’, however, this is a figurative comparison. It may be beautiful and philosophically significant, but requires support through specific morphological analysis: where is the centre,

where is radiality, which layers are present, what is the nature of the edge and which parameters can be measured? Without such support, the metaphor remains merely an artistic image.

The image of the World Tree likewise requires differentiation. The tree as a biological object may be investigated through its root, trunk, branches, leaves, fractality, branching and flow of substances. The World Tree as a cultural symbol may be analysed historically and hermeneutically. The cosmic tree as an image connecting levels is a philosophical metaphor. All three levels are important, but they are different. If they are confused, the book may appear to assert the literal existence of a single tree throughout every form of the world. The concern should instead be a structural model: root — concealed foundation; trunk — axis; branches — propagation; fruit — return to the seed.

Such differentiation is especially important to the scientific reception of the study. A scientist can accept the hypothesis for discussion only if it is clear that the author distinguishes measurable characteristics, philosophical conclusions and figurative expressions. If the text confuses these levels, it will appear to be mythopoetic speculation. If the levels are separated, the hypothesis acquires a more stable form: its testable component becomes available for analysis, its philosophical component for discussion and its figurative component for interpretation.

Testable propositions should be formulated as specifically as possible. For example: ‘Recurring features—centre, radiality, layering, branching and active edge—can be identified within BIO–GEO–COS objects.’ This proposition may be tested against a corpus of images. Or: ‘The fractal dimensions of the contours of certain biological and geological objects fall within comparable ranges.’ This may be measured. Or: ‘Branching structures at different levels demonstrate similar distributions of branch lengths and nodes.’ This may be tested statistically. The more specific the formulation, the greater its scientific value.

Philosophical propositions should be formulated differently. For example: ‘The recurrence of morphological characteristics permits the Matrix to be regarded as a hypothetical language of universal relationships of form.’ This is not a directly measurable statement, but a philosophical interpretation of testable observations. Or: ‘The relationship between natural and cultural forms may be understood as a transition of morphological invariants into symbolic structures.’ This proposition requires hermeneutic and cultural discussion rather than measurement alone.

Figurative propositions should be explicitly identified as metaphorical. For example: ‘The grain may serve as an image of the concealed potentiality of form.’ Or: ‘The flower may serve as an image of radial opening.’ Or: ‘The World Tree may serve as an image connecting levels.’ Such formulations preserve expressiveness without creating the false impression of a literal assertion. Metaphor becomes an instrument of explanation rather than a substitute for proof.

Three levels of evidence may therefore be distinguished within the hypothesis. The first is the empirical-morphological level. It works with images, measurements, characteristics, classification and statistics. The second is the theoretical-philosophical level. It formulates the concept of the Matrix, interprets the recurrence of invariants and connects form with process. The third is the figurative-heuristic level. It uses grain, flower, tree, lotus, star, wave and other images for explanation and intuitive understanding. All three levels are necessary to the book, but each must occupy its proper place.

The empirical-morphological level may be developed through specific methods: morphometry, fractal analysis, symmetry analysis, branching analysis, contour analysis, computer vision, image databases and statistical comparison. The following sections of this chapter will examine

precisely these methods. The principal point here is that what must be tested is neither the ‘beauty of resemblance’ nor a subjective impression, but formalised characteristics. Similarity must be translated into parameters. Only then is it possible to speak of scientific testing.

The theoretical-philosophical level must remain open to discussion. Even if morphometry demonstrates a consistent recurrence of particular characteristics, the question of how this should be interpreted will remain open. One researcher may argue that comparable mathematical constraints upon form are involved. Another may propose functional convergence. A third may point to the human cognitive tendency to perceive patterns. The author of the hypothesis may propose the Unified Matrix as a philosophical generalisation. This generalisation must, however, enter into dialogue with alternative explanations rather than declare itself the only possibility.

The figurative-heuristic level is necessary to the wholeness of the study. Without images, the hypothesis might become a dry catalogue of features. Without testing, however, the images might become arbitrary poetry. The author’s task is therefore to preserve equilibrium. Images must lead towards research rather than replace it. The metaphor of the grain must lead towards the analysis of closed potential forms. The metaphor of the flower towards the analysis of radial opening. The metaphor of the tree towards the analysis of axis, branching and levels. The metaphor of the Matrix towards the analysis of invariants rather than the abandonment of testing.

The presence of untestable or currently untestable propositions must also be acknowledged. A proposition concerning the ‘meaning of the Matrix’, for example, cannot be tested in the same manner as the length of a contour. The claim that all levels of the Universe are connected by a single universal principle may, for the present, remain a philosophical hypothesis rather than a proven fact. A claim concerning the profound connection between symbol and nature may be substantiated through cultural examples, but cannot be reduced to a single experiment. Acknowledging these limitations makes the study more honest and robust. A hypothesis is not required to prove everything immediately. It must clearly demonstrate what it proposes to test.

Testability also requires the possibility of a negative result. If analysis of a large corpus of images demonstrates that the proposed characteristics occur randomly, no more frequently than expected, or that the similarity disappears under rigorous annotation, the hypothesis must be revised. If the fractal dimensions of different objects prove incomparable, this is likewise important. If the classification of morphological types is excessively subjective and cannot be reproduced, it must be refined. Genuine testing entails a risk of refutation. Without this, the hypothesis remains merely an interpretative system.

The hypothesis must therefore progress from visual persuasiveness towards reproducible procedures. One researcher may perceive a similarity between a flower and a nebula, while another may not. If both use the same set of characteristics, the same method of contour extraction and the same algorithm for calculating symmetry and fractal dimension, however, their results may be compared. Scientific enquiry begins where observation becomes reproducible. The hypothesis of the Unified Matrix of the Universe must strive towards precisely this.

It should also be stated separately that cultural forms possess a different testing status from natural ones. Biological, geological and cosmic forms may be analysed as objects arising through natural processes. Cultural forms—artefacts, mandalas, bas-reliefs, the Sri Yantra and crop circles—result from human action, tradition, symbolisation and technique. They cannot therefore be used directly as natural confirmation of the Matrix. They may, however, be studied

as evidence of the morphological schemes that human beings select, preserve and repeat. This is no longer a physical test, but a cultural-morphological investigation.

Thus, the testable component of the hypothesis should primarily concern formal characteristics: centre, axis, symmetry, branching, layering, fractality, edge parameters, repetition, scale invariance and structural correlations. Its philosophical component concerns the meaning of the Matrix, the universality of form, the relationship between nature and symbol and the status of morphological invariants. Its figurative component concerns metaphors of grain, flower, tree, lotus, opening, cosmic axis and the living rhythm of form. These three domains are connected, but do not coincide.

The concluding proposition of this section may be formulated as follows: what can be tested scientifically is not the metaphysical Matrix itself as an integral meaning, but its proposed morphological traces—recurring, measurable and comparable characteristics of form. If such characteristics are consistently and statistically significantly identified across different classes of objects, the hypothesis acquires empirical support at the level of comparative morphology. If the characteristics prove random, excessively general or irreproducible, the hypothesis must be restricted or revised. The philosophical meaning of the Matrix may be discussed only after such analysis, not in place of it.

It is precisely this distinction that opens the way to the following sections of the chapter. Section 22.2 will examine morphometry as a set of methods for the quantitative analysis of form; Section 22.3 will address fractal analysis and methods for assessing scale invariance; Section 22.4 will consider the need to create comparative BIO–GEO–COS image databases; and Section 22.5 will examine statistical testing of the recurrence of features. Together, these sections must demonstrate that the hypothesis of the Unified Matrix of the Universe may be not only philosophical and figurative, but also a research programme. Its strength will depend upon how precisely it can transform visual analogies into testable characteristics.

22.2. Morphometry

Morphometry is one of the principal instruments capable of moving the hypothesis of the Unified Matrix of the Universe from the domain of visual analogies into that of testable analysis of form. If the preceding chapters demonstrated that a flower, leaf, valley, nebula, stone, planetary structure, artefact, World Tree, bas-relief, Sri Yantra, crop circle and lotus may display similar morphological characteristics, morphometry poses the next question: can these characteristics be measured? Can form be described not only through the words ‘resembles’, ‘recalls’, ‘opens’, ‘branches’ or ‘possesses a centre’, but also through quantitative parameters: degree of symmetry, curvature, contour complexity, number of branches, distribution of layers, relationship between centre and periphery, recurrence of elements and fractal dimension of the edge?

In its most general sense, morphometry is the quantitative description of form. It does not begin by asking about the meaning of an object, its symbolism or philosophical role. It asks: what is its geometry, what are its proportions, how is its contour organised, where is the centre, how pronounced is the axis, how are the elements distributed, is repetition present, what is the branching order, how symmetrical is the form and how complex is its edge? It is precisely such an approach that is required for the further development of the hypothesis. Without

morphometry, comparisons between flower and nebula, leaf and valley, tree and river network, or bas-relief and the scheme of the opening of the grain remain predominantly visual. With morphometry, they may become research procedures.

The first stage of morphometric analysis is image preparation. The form must be isolated from the background, adjusted to a comparable scale and, where possible, cleared of extraneous noise, perspective distortion, shadows, accidental damage and differences in illumination. For biological objects, the image may be a photograph of a leaf, flower, root, crown, shell or seed. For geological objects, it may be an image of relief, a channel network, cracks, folds, delta or coastline. For cosmic objects, it may depict a nebula, galaxy, filamentary structure or planetary surface. For cultural objects, it may be a photograph of an artefact, bas-relief, ornament, yantra or crop circle. In every case, it is important not merely to obtain an attractive image, but to prepare it as an object of measurement.

The first methodological risk arises here. An image is not always equivalent to the object. A photograph depends upon the angle of capture, illumination, resolution, processing, scale and selected fragment. A cosmic image may be the result of processing data obtained in different bands of radiation. A geological image may depend upon the altitude of capture and the season. A bas-relief may be damaged or fragmentary, or illuminated in such a way that certain lines become more pronounced. Morphometric analysis must therefore record the image source, scale, method of processing and criteria used to isolate the form. Without this information, the measurements may be visually impressive but irreproducible.

The second stage is the segmentation of form—that is, separating the object or structure under analysis from its background. For a leaf, the blade and veins must be isolated. For a flower, the contour of the petals and central region. For a river network, the channels and tributaries. For a nebula, the region of luminosity, filaments or shells. For a crop circle, the boundary between flattened and unflattened areas. For a bas-relief, the contours of signs, staff, circle, crescent, star, water and plants. Segmentation may be manual, semi-automatic or automatic. In every case, however, it must be described because all subsequent measurements depend upon it.

The third stage is feature selection. It is here that the hypothesis must become operational. It is insufficient merely to state that ‘the form resembles the Matrix’. The characteristics to be measured must be specified. These might include the presence of a centre, degree of centredness, presence of an axis, degree of symmetry, number of layers, contour parameters, edge curvature, number and order of branches, node density, area-to-perimeter ratio, recurrence of elements, nesting across scales, radial distribution and relationship between the central region and periphery. Such a set of characteristics may be described as the morphometric profile of form (*Fig. 1*).

Centredness is one of the fundamental parameters. Many forms appear centric visually, but this must be clarified quantitatively. It is possible to determine an object’s geometrical centre, the centre of mass of the image, the centre of radial distribution, the centre of symmetry or a functional centre. Within a flower, this may be its core; within a leaf, the point from which the petiole emerges or the intersection of the principal vein with the base; within a crop circle, the centre of the circumference; within a nebula, the region of maximum luminosity or the notional centre of the shell; and within a bas-relief, the compositional centre. It is then possible to measure how the elements of the form are distributed around this centre: uniformly, asymmetrically, in layers, along rays or chaotically.

Radiality is measured through the angular distribution of elements around the centre. Within a flower, for example, it is possible to determine the number of petals, angles among them, deviations from uniform distribution, petal length and width, and degree of recurrence. Within a nebula, the directions of filaments or shells in relation to the centre may be measured; within a crop circle, the number of radial rays, petals or chains of circles; and within a rosette or mandala, the repetition of sectors. Radiality is important because it transforms the centre into an active organiser of form. If elements are not merely situated around a centre but are distributed according to a recurring angular logic, the form acquires a morphometrically identifiable structure of opening.

Symmetry may also be measured. The simplest case is bilateral symmetry, in which the object is compared with its mirror image across an axis. A more complex case is radial or rotational symmetry, in which the form is compared with itself after rotation through a particular angle. It is possible to calculate the degree of correspondence among contours, the distribution of elements among sectors, deviation from ideal symmetry, asymmetry between the left and right sides and differences between internal and external layers. For the hypothesis of the Matrix, it is important not to claim that all forms are perfectly symmetrical, but to measure the extent to which symmetry is expressed and the manner in which it is disrupted.

The disruption of symmetry is no less important than its presence. Living forms are rarely absolutely symmetrical. A leaf may display slight deviations within its venation, a flower uneven petals, a tree an asymmetrical crown, relief accidental deformations and a nebula an inhomogeneous shell. Morphometry must therefore consider not only ideal order, but also variability. Sometimes the character of deviation from symmetry reveals the history of a form: the direction of wind, light, flow, pressure, damage, growth or external influence. This is important to the hypothesis: the Matrix should not be understood as a perfectly geometrical template, but as a system of invariants manifested through living and material variability.

Contour analysis is one of the most important areas of morphometry. The contour demonstrates the boundary of form—its active edge. It is possible to measure perimeter, area, the perimeter-to-area ratio, compactness, circularity, elongation, shape factor, degree of edge irregularity, number of projections and indentations, local curvature, angular distribution and the presence of repeated elements. Within a leaf, this makes it possible to describe serration, undulation or smoothness of the edge; within a petal, the form of opening; within a stone, an erosional or fractured contour; within a nebula, the complexity of its shell; within a crop circle, the precision and complexity of its boundary; and within an artefact, the character of the carved or relief edge.

Curvature is a more precise contour parameter. It demonstrates how rapidly the direction of a line changes along an edge. Within a smooth circle, curvature is relatively uniform. Within a complex leaf, crack, coastline or nebula, it changes abruptly. A curvature profile may be constructed along the contour to identify points of maximum bending, repeated waves, angles, vertices and points of abrupt transition. This is especially important to the analysis of the active edge because the edge is frequently the zone in which form interacts with its environment: the leaf with air and light, the coastline with water, the nebula with surrounding gas, the bas-relief with its background, and the field diagram with the unflattened vegetation.

The recurrence of elements may be measured through their number, size, spacing and regularity. These may include petals within a flower, triangles and lotus elements within the Sri Yantra, small circles, petals and rings within a crop circle, ornamental motifs upon an artefact, branches of the same order within a tree, and lateral veins within a leaf. Recurrence may be rigorous, as within

geometrical ornament, or variable, as within a living form. In both cases, it demonstrates that complexity is constructed not randomly, but through the repeated use of a particular structural operation. Morphometrically, this may be described through intervals, angles, dimensions, coefficients of variation and regularity of distribution.

Layering can likewise be measured. A layer may be a ring, shell, row of petals, geological stratum, concentric structure, level of a mandala, ornamental band or shell of a nebula. The number and thickness of layers, distances among them, degree of regularity, change in density from centre to periphery and ratio between inner and outer layers may all be calculated. Within the Matrix model, layering is important because it demonstrates stages and nesting: form does not merely expand, but passes through levels. Morphometry makes it possible to test the extent to which these levels are genuinely expressed rather than merely perceived by the observer.

Branching requires a specialised method. A branching structure may conveniently be represented as a graph consisting of nodes and edges. Nodes may be branching points, branch tips, intersections of veins, river confluences, intersections of cracks, root junctions or filamentary nodes. Edges are the sections between nodes. Once the structure has been represented in this way, it becomes possible to measure the number of nodes, degree of each node, branching order, segment length, branching angles, hierarchy, network density, average path length and relationship between the principal axis and lateral branches. Such graph analysis is especially important when comparing leaves, trees, root systems, river networks, cracks and cosmic filaments.

Skeletonisation is a technical procedure that facilitates the analysis of branching. A complex form or network is transformed into a thin ‘skeleton’—a system of lines preserving its principal topology. An image of leaf veins, for example, may be converted into a venation network; a river basin into a channel network; roots into a graph of the root system; and cracks into a fracture network. Quantitative methods may then be applied. Skeletonisation is especially useful because it translates a complex visual structure into a set of measurable lines and nodes.

For radial and petaloid forms, it is possible to analyse not only the contour, but also the radial profile. Rays are drawn from the centre of the form in different directions, and the distance from centre to edge is measured. This produces radius as a function of angle. Within an ideal circle, this function is almost constant. Within a flower, it contains peaks at the petals and depressions between them. Within a star, long and short radii alternate sharply. Within a complex crop circle, there will be a sequence of recurring variations. Such a radial profile makes it possible to describe the opening of form quantitatively: the number of petals, their uniformity, the degree to which the peripheral structure is expressed and the extent to which the form differs from a circle.

For elongated forms, axial parameters are important. It is possible to determine the principal axis of the form, length-to-width ratio, position of the centre relative to the axis, symmetry around the axis and distribution of lateral branches. This may be applied to a leaf, stalk, valley, staff within a bas-relief, artefact, filament, crack or elongated nebula. The axis is one of the principal invariants of the Matrix, but it must be measured. A form with a strong axis must be distinguished from one in which an axis is merely imagined. Morphometry makes this possible through principal directions, moments of inertia, an approximating ellipse, the skeleton of the form and the distribution of elements along the central line.

The relationship between centre and periphery possesses particular significance. The hypothesis of the Matrix frequently refers to a transition from the centre towards an opened edge. Morphometrically, this may be investigated through gradients: how does the density of elements

change from centre to periphery, does the complexity of the edge increase, do layers emerge, how are nodes distributed, how does curvature change, and where is the zone of maximum branching or activity? Within a flower, for example, the centre is dense and the petals open outwards. A nebula may possess a bright central region and a complex shell. A crop circle may contain a central circle and peripheral chains. A mandala may possess a central node and outer bands. Such gradients may be measured.

Morphometry may also analyse texture. Within certain objects, form is expressed not only through contour, but also through internal patterns: leaf veins, the texture of stone, folds in relief, the luminosity of a nebula, marks upon a bas-relief or the direction of stalks within a crop circle. Texture analysis may include the distribution of directions, line density, regularity of recurrence, contrast, local orientation and spectral features. This is especially important for objects in which the boundary is not always clear, such as clouds, nebulae, geological surfaces or damaged artefacts.

Scale normalisation is an important methodological principle. If a flower and a nebula are being compared, their physical dimensions are incommensurable. Morphometry may nevertheless compare dimensionless parameters: perimeter-to-area ratio, degree of symmetry, fractal dimension, angular distribution, relative layer thickness, number of levels, branching coefficient and normalised curvature. It is precisely such parameters that make it possible to speak of morphological comparability without asserting physical identity. This is fundamental to the entire study: what are compared are neither dimensions nor mechanisms, but relationships of form.

Control groups must also be introduced for the analysis to be valid. If the radiality of flowers, nebulae and artefacts is being measured, they must be compared not only with one another, but also with sets of random forms or forms of another type. Otherwise, it is impossible to determine whether the identified characteristics are genuinely persistent. If almost any form can be described as centric when desired, the characteristic loses its value. If centredness can be measured and shown to be statistically higher within particular classes of objects than within a control set, however, the analysis becomes meaningful. Morphometry must work not only with favourably selected examples, but also with negative cases.

Negative cases are especially important. The book has repeatedly emphasised that the hypothesis must not select only aesthetically compelling correspondences. Morphometry makes it possible to include forms that do not correspond to the proposed Matrix or correspond only weakly. These might include irregular stones, random cloud patches, damaged artefacts, chaotic cracks, diffuse nebulae, damaged leaves and fields without geometrical structures. They may then be compared with objects in which centre, axis, layers or branching are strongly expressed. This will help determine which characteristics are genuinely stable and which are products of selection.

Morphometric analysis must be reproducible. This means that another researcher using the same set of images and the same methodology should obtain similar results. Clear instructions are therefore required: how to select an object, isolate the contour, determine the centre, count branches, process noise, work with damage and normalise scale. Without reproducibility, the hypothesis will remain dependent upon the author's individual perception. With reproducibility, it can become a subject of discussion and criticism.

Cultural objects present a particular problem. Within natural forms, it is possible to speak of physical processes of growth, erosion, branching, flow, gravity and pressure. Cultural forms incorporate human intention, style, tradition, symbolism and technique. The morphometry of

cultural objects must therefore be cautious. The Sri Yantra may possess a high degree of symmetry not because it 'arose' through a natural law, but because it was constructed as a sacred geometrical scheme. Crop circles possess form because someone created them. A bas-relief possesses structure because its craftsman followed a compositional convention. This does not make them unsuitable for analysis. It simply means that they test not a natural mechanism, but the cultural selection of morphological invariants.

For cultural objects, therefore, the question must be formulated differently: which forms do human beings select to symbolise process? How frequently do centre, layers, radiality, lotus structures, symmetry and active edges occur within sacred geometry? How do artefacts record axes, waves, zigzags, spirals, circles and stars? How do cultural images translate natural forms into geometry? These questions may also be investigated morphometrically, but the results should be interpreted not as direct proof of a natural Matrix, but as an analysis of cultural morphology.

Morphometry for BIO–GEO–COS objects must be based upon a unified set of characteristics. For each image, for example, a profile may record the type of object, scale, source, presence of a centre, type of axis, type of symmetry, number of layers, presence of branching, fractal dimension of the contour, edge parameters, degree of radiality, presence of repeated elements, character of openness or closure and relationship between centre and periphery. Such a profile will make it possible to compare objects belonging to different levels not by general impression, but through a table of characteristics. Section 22.4 will proceed towards the creation of such image databases.

Morphometry may also help to clarify the concept of 'similarity'. Within ordinary visual perception, similarity is frequently subjective. One reader perceives a resemblance between a nebula and a flower, while another regards it as coincidental. Morphometry makes it possible to separate similarity into components. Two objects may be similar in radiality, but not in their edges. They may be similar in layering, but not in symmetry. They may possess comparable fractal dimensions, but not comparable centres. Such decomposition makes the analysis more precise. Instead of asking 'Are they similar in general?', it becomes possible to ask 'According to which characteristics are they comparable?'

This is especially important to protecting the hypothesis against the criticism of superficial analogy. If a flower and nebula are said to resemble one another, a critic may reasonably object that this is merely a visual impression. If it can be demonstrated that both objects possess a centre, radial distribution, a layered shell, a complex active edge and a comparable pattern of change in luminosity or density from centre to periphery, however, the discussion becomes more substantive. Even if the mechanisms differ, morphological similarity may be discussed as a set of measurable characteristics. It is precisely this that morphometry must provide.

Morphometric analysis may be presented in the form of a diagram or table (*Fig. 1*). Such an illustration might show a single conventional object beside a set of measurable parameters: centre, axis, radial rays, contour, edge curvature, layers, branches, nodes, zones of symmetry and relationship between the internal and external. It should not be an excessively dense technical diagram. Its purpose is to explain that form may be decomposed into characteristics and measured. Such an illustration would be especially useful because it translates the philosophical hypothesis into the language of research procedures.

Morphometry must not, however, create an illusion of absolute objectivity. Every measurement depends upon feature selection, segmentation method, scale, image quality, processing

algorithm and research purpose. Quantitative analysis does not eliminate interpretation, but disciplines it. It does not answer every philosophical question, but helps to distinguish persistent characteristics from accidental impressions. In this sense, morphometry is a bridge between visual intuition and scientific testing.

Morphometry is strategically important to the hypothesis of the Unified Matrix of the Universe. It makes it possible to formulate testable questions: do comparable types of centredness genuinely recur across different levels of nature? Do branching structures at different scales genuinely possess comparable patterns? Do active edges genuinely demonstrate similar parameters of complexity? Do cultural forms genuinely employ centres, layers and radiality more frequently than random decorative schemes? Do BIO–GEO–COS triads share more morphological features than randomly assembled groups of three images? Answers to such questions may already become the subject of research.

Morphometry must therefore become not an appendix to the hypothesis, but its instrument of testing. Attractive illustrations may draw attention, but scientific value emerges when form receives a numerical description. If the hypothesis withstands morphometric testing, it will become substantially stronger. If testing reveals weaknesses, this too will be useful: concepts may be refined, the scope restricted, excessively broad claims abandoned and genuinely stable types identified. In every case, morphometry makes the hypothesis more honest and productive.

Thus, morphometry makes it possible to proceed from the general claim that ‘the forms of the world resemble one another’ to a more rigorous formulation: ‘measurable morphological characteristics—such as centredness, symmetry, layering, branching, edge parameters, radiality and recurrence across scales—recur within particular classes of objects’. This is a scientifically discussable proposition. It does not prove the metaphysical meaning of the Matrix, but may confirm the presence of its proposed morphological traces. Morphometry is therefore the first necessary step on the path from philosophical hypothesis to research programme.

22.3. Fractal Analysis

Fractal analysis is one of the most promising tools for testing those propositions of the Unified Matrix of the Universe hypothesis that concern self-similarity, repetition across scales, edge complexity and the hierarchical organisation of form. In previous chapters, fractality was repeatedly mentioned in the analysis of trees, leaves, roots, river networks, valleys, cracks, coastlines, relief, nebulae, cosmic filaments, ornaments and sacred diagrams. In a scientific context, however, it is not enough to say that an object ‘resembles a fractal’ or ‘has a fractal structure’. It is necessary to clarify the sense in which it is fractal, the scales at which self-similarity occurs, the methods by which this can be tested and the quantitative indicators that can be obtained.

First and foremost, a distinction must be drawn between strict mathematical fractality and natural fractality. A mathematical fractal may be constructed according to a precise rule that repeats indefinitely or, in idealised form, at arbitrarily small scales. Natural forms are organised differently. A tree, leaf, coastline, cloud, crack, root system or nebula is not an ideal fractal. Its self-similarity is limited by scale, material, energy, environment, growth history, damage, randomness and physical processes. This book should therefore speak not of ideal fractality, but of the fractal-like or scale-invariant organisation of form within particular ranges.

This qualification is fundamental. If natural objects are declared to be ‘fractals’ without reservation, the claim may rightly be criticised. If, however, certain natural and cultural forms are said to display signs of self-similarity or scale-dependent complexity within a limited range, the proposition becomes testable. The branching of a tree, for example, repeats a general principle at the levels of the trunk, major branches, smaller branches and shoots. Leaf venation repeats a tree-like pattern within a plane. A river network has tributaries of different orders. Cracks may form a hierarchy of branches. A coastline displays different lengths when measured at different scales. These are precisely the properties that fractal analysis should investigate.

The best-known method for estimating the fractal dimension of an image is *box-counting*, or the box-counting method. Its basic principle is simple: an image of a form is covered with a grid of squares of a particular size, after which the number of squares containing part of the analysed object is counted. The cell size is then reduced and the count repeated. If the number of occupied cells changes according to a power law as the scale changes, the fractal dimension can be estimated. The more complexly a form fills space, the higher its fractal dimension. A smooth line, for example, has a dimension close to 1; a filled planar region, a dimension close to 2; and a complex winding contour or network may occupy an intermediate position.

For the Matrix hypothesis, the box-counting method is particularly important because it makes it possible to describe the complexity of an edge or network quantitatively. A leaf contour, coastline, nebular boundary, edge of a cloud formation, crack network, root system, branching pattern or artefact contour may be converted into binary form and subjected to analysis. This allows not only a visual impression but also a numerical measure of complexity to be compared. One might ask, for example, whether the contours of biological and geological objects have similar ranges of fractal dimension; whether natural branching networks differ from cultural ornaments; or to what extent edge complexity increases as a form passes from a closed to an opened state.

Box-counting must, however, be used with caution. The result depends upon image quality, the segmentation method, the range of scales, grid selection, resolution and noise. If an image has a low resolution, fine details will be lost. If the contour is extracted incorrectly, the dimension will be distorted. If the range of scales is too narrow, an apparent power-law relationship may be illusory. If the object is not scale-invariant, the method may still produce a number, but that number will have little meaning. Fractal dimension should therefore not be used as a magical characteristic. It is meaningful only when the procedure is rigorously described and the quality of the approximation is assessed.

It is particularly important to specify the range of scales over which fractal-like behaviour is observed. Natural objects almost never preserve self-similarity at every level. A tree has limits: trunk, branches, shoots, leaves and cells. Distinct mechanisms operate at each level. A coastline has limits associated with the scale of the map, rocks, sand, waves and image resolution. A nebula has physical boundaries determined by gas dynamics, radiation, gravity and observational resolution. It is therefore more accurate to say that an object exhibits scale-dependent complexity within a particular range than to say that it ‘is a fractal’ in general.

Another important method is the analysis of scale invariance. This is broader than the mere calculation of fractal dimension. Scale invariance means that certain properties of a form are preserved or change in a regular manner as observation moves from one scale to another. The distribution of branch lengths, for example, may follow a particular regularity; the number of elements of a given size may decrease according to a power law; node density may change

predictably; or a contour may preserve a similar degree of irregularity under magnification. Such properties can be analysed using logarithmic plots, size distributions, power-law relationships and parameters of self-similarity.

For branching structures, the analysis of branching orders is particularly important. In a tree, it is possible to distinguish the trunk, first-order branches, second-order branches, third-order branches and so forth. In a river network, the principal channel and tributaries of the first, second and third orders may be identified. In a root system, the main root and lateral roots of different orders may be distinguished. In a leaf, there are the central vein, lateral veins and fine venation. For each order, it is possible to measure average length, thickness, branching angle, number of branches, the ratio between the length of a parent branch and those of its daughter branches, and node density. If such parameters demonstrate a regular change from one order to the next, it becomes possible to speak of the scale-dependent organisation of branching.

Such analysis is especially important for comparisons within BIO–GEO–COS. Biological branching structures, river networks and cosmic filaments arise through different mechanisms. A tree grows through biological processes, a river is shaped by flowing water and relief, and cosmic filaments are associated with the distribution of matter and gravitational dynamics. At the morphological level, however, all of them may be represented as networks of nodes and lines. Fractal and graph analysis make it possible to compare their structural parameters without asserting their physical identity. This makes the analysis considerably more rigorous than a simple visual comparison.

Spectral analysis may be used to investigate the spatial organisation of form. If an image or contour is represented as a signal, the distribution of its spatial frequencies can be examined. Simple, smooth forms contain fewer high-frequency components, while complex, irregular forms contain more. In textures, relief, clouds, nebulae, fields, crack structures and plant surfaces, spectral analysis may reveal prevailing scales, rhythms, periodicity, noise-like complexity or evidence of power-law distributions. This is especially useful where a form lacks a distinct contour but possesses a complex internal texture.

A nebula, for example, may lack a sharply defined boundary, yet its brightness is distributed unevenly: it contains dense regions, filaments, shells and diffuse zones. A relief surface may be described through elevations, folds, faults and textural variations. A field diagram may display differences in the direction of stems and in tonal contrasts. Spectral analysis allows such images to be examined not only in terms of their external contour, but also through the internal distribution of their structure. This is important to the Matrix hypothesis because many forms display order not only along their edges, but also within the field itself.

Another area of investigation is multifractal analysis. This is applied when an object cannot be described by a single fractal dimension because different parts of its structure possess different degrees of complexity. A nebula, for example, may contain dense filaments and diffuse regions; a root system, thick primary roots and extremely fine rootlets; a river network, principal channels and minor tributaries; and a landscape, smooth slopes and deeply dissected erosion zones. A multifractal approach describes not one dimension, but a spectrum of dimensions reflecting the heterogeneity of the form. This may be especially useful for objects in which the Matrix manifests itself not as a single, simple pattern, but as a complex hierarchy.

Fractal analysis of an edge must be distinguished from fractal analysis of a network. A contour object, such as a leaf or coastline, is analysed through the complexity of its boundary. A network object, such as a tree, river or venation system, is analysed through the structure of its lines and

nodes. In certain cases, both approaches may be applied simultaneously. A leaf, for example, has an external contour and an internal network of veins. A river delta has a network of channels and an external coastal contour. A nebula may possess a complex shell and internal filaments. An artefact may have an ornamental network and a complex outer edge. The research protocol must therefore specify in advance precisely what is being analysed: the edge, network, texture, brightness distribution or entire binary region.

To estimate the fractal dimension of contours, it is often necessary to convert an image into a line. This may be done by extracting the object's boundary. Networks may be processed through skeletonisation, while textures may be analysed as brightness fields. Each method produces different results. If the same form is analysed as a filled region, a contour and a skeleton, different dimensions may be obtained. This is not an error, provided the levels of analysis are distinguished. On the contrary, it may be useful: a single form may have a compact area, a complex edge and a branching internal network. Each parameter describes a different aspect of its morphology.

Fractal analysis is especially well suited to testing the proposition of self-similarity. In the chapters on the tree and the lotus, self-similarity was described qualitatively: a branch repeats the tree, leaf venation repeats branching, roots mirror the crown, and petals repeat the general principle of opening. This proposition can now be specified more precisely. The distribution of branch lengths across different orders, branching angles, node density, the sizes of recurring elements and the manner in which scale decreases can all be compared. If the repetition of structure is truly regular, it should be manifested in numerical relationships. If the similarity is merely apparent, the analysis will reveal this.

For sacred geometry and cultural forms, fractal analysis has a particular status. Many geometric schemes are not fractal in the natural sense, but may include repetition, nesting, self-similar elements and scale-dependent organisation. An ornament, for example, may repeat a motif at several levels; crop circles may incorporate larger and smaller circles; the Sri Yantra contains nested triangular structures; and a lotus mandala repeats petals around a centre. Here, fractal analysis may help to describe the degree of nesting and repetition, but the results must be interpreted as cultural and geometric rather than natural and physical.

Particular caution is required when claiming that sacred geometry is 'fractal'. In some cases, the term is used too freely. Strict fractality presupposes a particular regularity across scales. If a scheme simply contains recurring elements or nested figures, this alone does not make it a fractal. This book should therefore use more precise expressions: 'fractal-like organisation', 'nesting across scales', 'self-similar motif', 'repetition of structure at different levels' and 'geometric hierarchy'. Such formulations preserve scientific caution and prevent fractality from becoming a universal metaphor.

Fractal analysis may also help to test the concept of the active edge. In natural processes, the edge is often a zone of maximum interaction: the coast with water, the leaf with air, the petal with its environment, the nebula with the surrounding gas, the crack with its material, the flame with air, and the cloud with the atmosphere. Edge complexity may be related to the intensity of processes occurring along the boundary. If the edge is smooth, its fractal dimension is lower. If it is irregular, branching, undulating or multilayered, its dimension is higher. Such a relationship is not universal, of course, but it can be investigated. This is important to the Matrix hypothesis: the active edge ceases to be merely a figurative expression and acquires a measurable indicator.

One might, for example, compare the fractal dimension of the edge of a bud, an opened flower and a wilting flower; a smooth stone and a fractured stone; a simple circle and a complex field diagram; a compact nebula and a filamentary nebula; or a straight coastline and a deeply indented coast. If the opening of a form is accompanied by an increase in edge complexity, this can be demonstrated quantitatively. If it is not, the hypothesis must be refined to acknowledge that not every opening increases fractal complexity. Such an approach helps to prevent excessive generalisation.

Fractal analysis is also useful for distinguishing different types of similarity. Two forms may look similar but have different fractal parameters. Conversely, they may appear visually dissimilar while possessing comparable scale-dependent complexity. A tree crown and a river network, for example, may look different, yet their graph and fractal parameters may prove comparable. A floral rosette and a crop circle may possess similar radial symmetry but different edge complexity. A nebula and a landscape may display similar textural heterogeneity but different contour parameters. Fractal analysis therefore helps to decompose similarity into precise components.

One important outcome of such analysis may be the construction of a morphological feature space. Each object can be represented as a point within a multidimensional space whose coordinates include the fractal dimension of the contour, the fractal dimension of the network, degree of radiality, number of layers, symmetry, branching parameters and texture complexity. It then becomes possible to examine which objects are located close to one another: do biological, geological and cosmic forms cluster according to structural type? Do mixed clusters emerge in which objects from different levels possess similar morphological parameters? Do cultural geometric forms differ from natural ones? Such questions already lead towards statistical testing.

Fractal analysis may also be applied to the BIO–GEO–COS model. For the triad ‘leaf — valley — cosmic shell’, for example, it would be possible to measure the network complexity of leaf veins, drainage networks and filamentary structures. For the triad ‘flower — relief — nebula’, radiality, layering and edge complexity could be measured. For the triad ‘bud — stone — planetary structure’, shell-like organisation, cracks, contours and internal lines of stress could be analysed. Such an approach would make it possible to test how robust the selected triads truly are, rather than merely how aesthetically convincing they appear.

It is important to recognise that fractal analysis does not replace morphometry, but complements it. Morphometry measures form in a broad sense: symmetry, curvature, contour, layers and branching. Fractal analysis focuses upon scale-dependent complexity and self-similarity. One object may possess a high degree of symmetry but low fractal complexity. Another may have low symmetry but a high fractal dimension along its edge. A third may lack a strong centre but possess a complex network. The results must therefore be considered together. If the Matrix describes a system of formal invariants, it cannot be reduced to a single fractal dimension.

It must also be recognised that fractal dimension does not in itself explain a mechanism. Two objects may possess similar fractal dimensions yet arise through entirely different causes. A coastline, a tree crown and a cloud boundary may have similar complexity parameters, but they are shaped by different processes. Fractal analysis therefore provides morphological rather than causal evidence. It demonstrates structural similarity, but does not prove the existence of a common physical mechanism. This is fundamental to the hypothesis: the Matrix should be

understood as a language of formal invariants, not as the assertion that all objects have the same cause.

The visual illustration accompanying this section might demonstrate the principle of fractal analysis (*Fig. 2*). It could, for example, depict a complex contour or branching structure overlaid with grids of different scales for the box-counting method. Beside it, the decreasing cell size and increasing number of occupied cells could be shown, together with a schematic comparison of three objects—a leaf-vein system, a river network and a cosmic filament—as network structures. The illustration should be comprehensible without being overloaded with formulas. It should communicate the central idea: form is analysed at different scales, and its complexity can be measured.

Such an illustration would help the reader understand that fractality is not merely an appealing term within this book. It can be investigated through a specific procedure. Grid, scale, counting, graph, distribution and dimension translate visual intuition into testable analysis. If the reader sees how the same method may be applied to a leaf, crack, coastline, nebula or artefactual ornament, the research potential of the hypothesis will become clearer.

In future work, fractal analysis should be linked to the creation of an image database. Without a corpus of data, it will remain a collection of isolated examples. It is not enough to calculate the fractal dimension of one beautiful leaf or a single nebula; many objects of each type must be analysed. Only then will it be possible to discuss ranges, mean values, variability, statistical significance and differences between classes. The fractal dimensions of leaves from different plants, river networks from different regions, cracks in different materials, different types of nebulae and ornaments from different cultures could, for example, be compared. This corpus-based approach will be examined in the following section.

Fractal analysis must also include tests of result robustness. The same object should be analysed using different processing parameters: different segmentation thresholds, grid scales, resolutions and contour-extraction methods. If the result changes sharply, any conclusions must remain cautious. If the result remains similar, the analysis is more reliable. This is especially important for cosmic and geological images, in which data processing may exert a considerable influence upon the visible structure.

For the hypothesis of the Unified Matrix of the Universe, fractal analysis possesses not only technical but also philosophical significance. It demonstrates that form may preserve certain relationships as scale changes. This underlies many of the comparisons made in this study: the small repeats the large, the part bears the principle of the whole, a branch resembles a tree, a leaf vein resembles a river network, a field diagram resembles a mandala, and a nebula resembles a flower not as an object, but as a principle of opening. Fractal analysis makes it possible to determine where such statements have a quantitative basis and where they remain metaphorical.

This philosophical significance must, however, follow measurement rather than precede it. One cannot begin by declaring the world fractal and then select examples to support the claim. The reverse path must be followed: objects should be selected, features defined, analysis conducted, results assessed, control groups compared and only then should the philosophical implications be discussed. Only this order makes the hypothesis scientifically responsible. In this sense, fractal analysis is a discipline of testing rather than an ornament of the concept.

The conclusion of this section may be formulated as follows: fractal analysis makes it possible to test those aspects of the hypothesis that concern self-similarity, scale invariance, edge complexity, branching and the hierarchy of form. The box-counting method, spectral analysis, the analysis of scale-dependent distributions, graph analysis of branching and multifractal approaches can provide quantitative indicators that are comparable across objects from different levels. These indicators do not prove the existence of a metaphysical Matrix, but they may confirm or refute the presence of recurring morphological regularities. Fractal analysis is therefore an essential link between the study's visual intuition and its potential scientific verification.

22.4. Comparative Image Databases

For the scientific testing of the Unified Matrix of the Universe hypothesis, it is necessary to create comparative image databases in which objects from different levels are collected, described and annotated according to a common set of features. Without such a database, the analysis will remain dependent upon individual, carefully selected illustrations. A flower, nebula, leaf, valley, stone, planetary structure, root, river network, bas-relief or lotus may appear convincingly similar when presented side by side in a book. Scientific testing, however, requires a different level of analysis: rather than examining isolated, striking pairs and triads, it is necessary to analyse a large corpus of images in which similarities and differences can be described quantitatively, reproducibly and statistically.

This is why the creation of a BIO–GEO–COS database should be the most important next step. This name may be used for a corpus of images encompassing objects from biological, geological, hydrogeomorphological and cosmic levels, together with a separate cultural and artefactual layer where appropriate. Such a database should not be merely an archive of beautiful images, but a research instrument. Every object within it should have a record containing its source, scale, object type, level, image quality, acquisition method, degree of processing, set of morphological features and measurement results. Only in this way can the hypothesis move from visual comparison to reproducible comparative morphology.

The first section of the database—BIO—should include biological forms. These might comprise flowers, leaves, trees, roots, seeds, buds, fruits, shells, vascular networks, neural structures, corals, mycelial networks, colonies of microorganisms, cellular structures, insect wings, leaf venation, radial floral forms and spiral plant structures. It is important not to include only those objects that correspond closely to the hypothesis. Weak and negative examples must also be represented: forms without a pronounced centre or radiality, forms with disrupted symmetry, damaged forms and forms with chaotic structures. Only then will it be possible to determine how stable the proposed features truly are.

The second section—GEO—should include geological and geomorphological forms: mountain ranges, folds, faults, crack networks, stones, minerals, crystalline structures, volcanic formations, lava flows, erosional forms, deltas, coastlines, desert patterns, glacial structures, craters, relief shells, stratified layers, geodes and rock surfaces. This section is particularly important because geological forms arise not through biological growth, but through pressure, faulting, erosion, sedimentation, crystallisation, tectonics, volcanism, weathering and other physicochemical processes. If morphological features recur here, this strengthens the question

of structural invariants, while simultaneously requiring the mechanisms involved to be rigorously distinguished.

The third section—HYDRO or GEO-HYDRO—should include forms associated with water and flows: river networks, deltas, channels, ravines, valleys, drainage basins, traces of runoff, glacial channels, tidal structures, coastal patterns, lava or mud flows as analogues of fluid processes, aquatic vortices and wave structures. This section may be distinguished separately because aquatic and channel systems often display particularly expressive branching and scale-dependent hierarchy. They constitute an important bridge between biological networks and geological relief. Leaf venation, root systems and river networks can be compared precisely through their branching parameters, nodes, and principal and lateral lines.

The fourth section—COS—should include cosmic forms: nebulae, galaxies, spiral arms, planetary surfaces, craters, supernova shells, clouds of gas and dust, filamentary structures, star clusters, protoplanetary discs, magnetic and plasma structures, and images of matter distribution at different scales. This section requires particular caution because cosmic images are often the result of complex data processing. Colour, brightness, contrast, wavelength range, channel combination and visualisation methods can substantially influence the perception of form. For every COS image, it is therefore necessary to record exactly what is represented: an optical image, infrared data, radio data, an X-ray image, a composite of multiple channels or a processed scientific visualisation.

The fifth section, which might be designated CULT or ART, should include cultural forms: artefacts, bas-reliefs, ornaments, sacred diagrams, the Sri Yantra, mandalas, lotus schemes, crop circles, architectural plans, tree-like models, grain symbols, rosettes, waves, zigzags, spirals and geometric compositions. This section has a different status from BIO–GEO–COS. Cultural forms are not natural objects and should not be used as evidence of a natural mechanism. They may, however, provide material for analysing which morphological invariants humans select, preserve and repeat in symbolic form. The cultural section should therefore be included separately, with its hermeneutic status clearly identified.

The principal purpose of the database is to create a common descriptive language. Every object, irrespective of its level, should be described according to the same set of features. These might include the presence and type of a centre; the prominence of an axis; the type of symmetry; the degree of radiality; the presence and number of layers; the presence and type of branching; the number of branching orders; edge parameters; fractal dimension; the presence of a spiral; the presence of recurring elements; the degree to which the form is open or closed; the relationship between centre and periphery; the presence of an active boundary; the presence of nesting; repetition across scales; and the type of dominant structure. Such a unified protocol will make it possible to compare highly diverse objects without conflating their mechanisms.

A flower from the BIO section, a delta from HYDRO, a nebula from COS and a rosette from CULT, for example, may all be described according to the same formal features: whether a centre is present, how elements are distributed around it, whether radial directions and layers exist, the character of the contour, the complexity of the edge and whether elements recur. At the same time, the record must specify that their mechanisms of origin differ: biological development, water flow, gas dynamics or cultural composition. This will preserve the study's principal methodological rule: compare forms without conflating causes.

An important component of the database should be the morphological record of each object. It might include several sections:

- The first, identification: name, type, level, source, author or institution, date, scale, resolution, imaging conditions or origin of the image.
- The second, descriptive: a brief visual description of the object, its condition, completeness, damage, fragmentation and distinctive features of the image.
- The third, annotative: contour, centre, axis, layers, branches, nodes, edges and regions of interest.
- The fourth, quantitative: measurements of symmetry, curvature, fractal dimension, branch number, radial profile and the recurrence of elements.
- The fifth, interpretative: a possible relationship to a Matrix type, the degree of confidence and the limitations of the analysis.

Such a record is especially important for reducing subjectivity. If a researcher merely says that an object resembles a flower, this provides little useful information. If, however, the researcher states that the object possesses a central region, five pronounced radial directions, three concentric layers, a contour with a fractal dimension within a specified range, a complex active edge and symmetry of the second or fifth order, the comparison becomes substantive. Another researcher can verify these features, recalculate the parameters and agree or disagree with the annotation. The database transforms an observation into material that can be examined and debated.

A feature taxonomy must be established in advance for the image database. Features may be binary, categorical or quantitative. Binary features answer a question of presence or absence: whether a pronounced centre, branching, a spiral or layering is present. Categorical features specify the type: symmetry may be radial, bilateral, axial, rotational or absent; branching may be tree-like, reticular, fracture-like or filamentary; and an edge may be smooth, undulating, serrated, fractal or ruptured. Quantitative features provide numerical values: the number of petals, the number of layers, symmetry coefficient, fractal dimension, average branching angle, perimeter-to-area ratio and degree of compactness.

It is very important to distinguish between first-order and second-order features. First-order features are direct characteristics of a form: centre, axis, branches, layers and edge. Second-order features are relationships between features: centre combined with radiality, axis combined with branching, layering combined with an active edge, repetition combined with nesting across scales, or symmetry combined with the disruption of symmetry. Such combinations of features are particularly important to the Matrix hypothesis. A circle alone reveals relatively little. A circle with a centre, layers, radial elements and an active edge, however, forms a much stronger morphological structure. The database must make it possible to record such combinations.

The degree to which each feature is expressed should also be recorded. A centre, for example, may be strong, moderate, weak or absent. Radiality may be high, moderate or weak. Layering may be regular or irregular. Branching may be hierarchical or chaotic. An active edge may be clearly defined or diffuse. Such scales will help to avoid a crude division between ‘present’ and ‘absent’. In real forms, features are often manifested gradually. This is especially important for natural objects, in which ideal geometry is almost never encountered.

The database should include not only positive examples but also control sets. If similarities between flowers and nebulae are being investigated, for example, it is necessary to include not only the most flower-like nebulae, but also randomly selected nebulae and nebulae without pronounced radiality. If leaves and river networks are being compared, leaves with different types of venation and drainage basins with different structures must be included. If crop circles are

analysed as processual diagrams, they should be compared with simple geometric drawings, accidental traces in fields and ornaments of other kinds. Control groups are necessary to distinguish a genuine regularity from the selective choice of favourable images.

Particular attention should be paid to random sampling. A visual hypothesis is often affected by selection bias: only images that support the idea are chosen. A scientific database must employ predetermined selection rules. It would be possible, for example, to select the first hundred images of nebulae from a particular catalogue, a random sample of leaves from a botanical database, a fixed set of drainage basins from open geospatial data or a defined corpus of artefacts from museum collections. The results would then be less dependent upon the researcher's preferences. If the features of the Matrix are also present in a random sample, this would constitute a much stronger argument.

Multilevel annotation is another important principle. A single object may be annotated in several ways. In a leaf, for example, the external contour, central vein, lateral veins, fine network, damaged regions, growth centre and edge may be identified separately. In a nebula, it is possible to distinguish the external shell, bright core, filaments, regions of high density and layers of luminosity. In a bas-relief, figures, signs, the axis, circle, crescent, star, waves and plant elements may be distinguished. Such multilevel annotation will make it possible to analyse not only the object as a whole, but also its internal structure. This is especially important for complex forms in which a single overall indicator may conceal different levels of organisation.

Scale must also be recorded in the BIO–GEO–COS database. It may be absolute, where the object's actual dimensions are known, or relative, where only the image is analysed. Scale is often available for biological objects. For geological objects, it depends upon the map or image. For cosmic objects, it may be related to astronomical distances and angular dimensions. For cultural objects, it is associated with the dimensions of the artefact or image. Scale is important, but dimensionless indicators are especially necessary for comparative morphology. The database should therefore retain both absolute data and normalised parameters.

Image processing presents a separate problem. Both the original image and the processed version must be preserved. The original image is required for verification and repeated analysis. The processed version may include binarisation, contour extraction, skeletonisation, noise removal, alignment, scale normalisation and perspective correction. Every processing stage must be documented. Ideally, the database should preserve not only the result but also the processing procedure: the thresholds used, filters applied, regions excluded and algorithmic parameters specified. This makes the analysis transparent.

The database should support both manual and automated work. At an early stage, many features may be annotated manually by experts, especially where complex cultural objects are involved. In the future, however, it would be desirable to use computer-vision methods: automatic contour extraction, symmetry detection, centre detection, texture analysis, branching detection, skeletonisation and form classification. Manual annotation is required for quality and interpretation, while automated annotation is required for scale and reproducibility. Combining these approaches will make it possible to create a more reliable research system.

For quality control, independent annotation by several experts should be employed. Two or three researchers, for example, might independently assess the presence of a centre, layering, radiality, branching and an active edge. The agreement between their annotations could then be measured. If the experts frequently disagree, the feature must be defined more precisely. If agreement is high, the feature is more reliable. This is especially important for features that are

difficult to formalise, such as the ‘active edge’ or ‘morphological opening’. The database should not conceal such difficulties, but make them visible.

A comparative image database should also incorporate a system of confidence levels. Not all objects are equally suitable for analysis. Some images have high resolution, a clearly defined scale, a distinct contour and good preservation. Others are blurred, damaged, fragmentary or heavily processed, or possess an ambiguous structure. Each object may therefore be assigned a data-quality rating: high, medium or low. Conclusions drawn from low-quality objects must remain cautious. This is especially important for archaeological and cosmic images, where apparent form may depend upon preservation or visualisation.

A central function of the database will be the construction of comparative feature matrices. Each row of such a matrix represents an object, while each column represents a feature or parameter: the object’s level, type of form, presence of a centre, degree of radiality, number of layers, presence of branching, fractal dimension, edge complexity, type of symmetry, presence of a spiral and presence of recurring elements. Such a table will allow statistical methods to be applied, including clustering, correlation analysis, factor analysis, group detection, comparison of distributions and hypothesis testing concerning the frequency of particular features. This will prepare the transition to Section 22.5.

The database will also make it possible to test the strength of BIO–GEO–COS triads. Chapter 17 proposed several visual triads: flower—relief—nebula; leaf—valley—cosmic shell; bud—stone—planetary structure. Within the database, it will be possible not merely to display such triads, but to evaluate them according to their features. A triad might be regarded as strong if its objects correspond across several independent parameters, such as centredness, layering, radiality and the active edge. A triad would be regarded as weak if the resemblance were based upon only one feature. Such evaluation will transform the method of visual triads into a more rigorous instrument.

In addition to triads, morphological families may be constructed. A family of radial-layered forms, for example, might include flowers, rosettes, certain nebulae, crop circles, mandalas and geological ring structures. A family of axial-network forms might encompass leaves, trees, river networks, roots, vascular systems and filamentary cosmic structures. A family of closed forms of tension might include buds, seeds, geodes, stones, planetary shells, capsules and eggs. Such families can be described through their common features and then tested to determine how stable they truly are within the database.

The image database will also help to reveal differences as well as similarities. This is important. Some forms may appear visually similar but differ sharply when measured. Cultural forms may possess much higher symmetry than natural forms. Natural branching structures may have a more complex fractal organisation than ornaments. Geological forms may display a greater degree of edge randomness than biological objects. Such differences do not automatically refute the hypothesis, but they refine it. The Matrix may manifest itself not as identity, but as a set of invariants modified by environment, material and mechanism.

It is particularly important that the database will make it possible to work with negative results. If a proposed invariant is not found within a particular class of objects, this must be recorded. Cosmic structures without a pronounced centre, for example, should not be forced into centred models. The absence of layering in certain geological forms is significant. Cultural ornaments that do not demonstrate processuality should not be interpreted as manifestations of the Matrix.

Negative cases help to make the hypothesis honest and properly bounded rather than all-encompassing and untested.

The database should remain open to expansion. At the first stage, a pilot corpus consisting of several hundred images could be created. It could subsequently be expanded by level and type: a separate corpus of leaves, a corpus of river networks, a corpus of nebulae, a corpus of artefacts and a corpus of sacred geometries. New parameters could gradually be added, annotations improved, results compared and classifications refined. In this form, the Unified Matrix of the Universe hypothesis becomes not a closed doctrine but a developing research programme.

The illustration accompanying this section might demonstrate the structure of such a database (*Fig. 3*). It could be presented as a scheme containing several sections: BIO, GEO, HYDRO, COS and CULT. Images of objects would lead from each section to a unified morphological record, followed by a feature table and then a comparative matrix. Such an illustration would help the reader understand that the aim is not to assemble visual analogies, but to create a corpus of data. The analytical sequence should be made clear: image—annotation—features—measurements—comparison—statistical testing.

Such a database could be called the 'Atlas of Morphological Invariants'. The atlas should not be merely a visual album. It should integrate image, description, measurement and interpretation. For every object, the atlas should present the original image, an annotated version, a feature table and a brief conclusion concerning the type of form. Over time, such an atlas could become the basis of an interdisciplinary investigation in which biologists, geologists, astronomers, art historians, computer-vision specialists and philosophers of form work with the same corpus while asking different questions.

Interdisciplinarity is fundamental here. A single author cannot assess every level—botany, geology, astrophysics, archaeology, religious studies and computer image analysis—with equal professional competence. The database must therefore be structured so that different specialists can verify their respective areas: a biologist can refine the description of a leaf or flower; a geologist, that of a relief form or fault; an astronomer, the nature of a cosmic image; an art historian or archaeologist, that of a cultural object; an image-analysis specialist, the validity of the measurements; and a philosopher, the level of generalisation. Only in this way can the hypothesis move beyond an individual visual impression.

A comparative image database will also help to distinguish universal invariants from excessively general features. Almost every object, for example, possesses an edge. An edge alone is therefore not a strong feature. A complex active edge with a particular fractal dimension, recurring projections and a relationship to internal layers may be much more significant. Almost any object can be positioned artificially at the centre of an image, but a pronounced internal centre that organises the structure is a stronger feature. The database will make it possible to determine which features are genuinely informative and which are too general.

This will lead to a more precise formulation of the hypothesis. The Unified Matrix may ultimately describe not all forms in general, but particular classes of processes: opening from a centre, branching propagation, shell-like tension, layered formation, the active edge and repetition across scales. The database will help to reveal which classes possess empirical support. Such specification will strengthen the hypothesis because it will cease to claim that it explains everything at once and will instead address particular morphological types.

Ultimately, the comparative BIO–GEO–COS database must answer the central question: do particular morphological features recur at different levels of nature more frequently than would be expected by chance? If so, which features? In what combinations? In which types of objects? At which scales? With what exceptions? If not, which propositions of the hypothesis require revision? These questions make the database an essential instrument. Without it, the hypothesis will remain philosophically expressive but empirically weak. With it, the hypothesis can become the subject of genuine investigation.

Thus, the creation of comparative image databases is a central condition for the scientific testing of the Unified Matrix of the Universe hypothesis. The database should include natural and cultural forms while clearly distinguishing their status. Every object should be described according to a common set of features, annotated, measured and incorporated into a comparative matrix. Such work will enable a transition from subjective resemblance to testable features, from isolated illustrations to a corpus of data, and from philosophical intuition to a research programme. This is why the BIO–GEO–COS database is not a technical appendix, but the methodological core of the hypothesis's future testing.

22.5. Statistical Testing

Statistical testing is the final link in the scientific programme proposed in this chapter. Morphometry makes it possible to measure the characteristics of form. Fractal analysis makes it possible to assess scale-dependent complexity, self-similarity, and the parameters of edges and branching. The comparative BIO–GEO–COS image database makes it possible to assemble a corpus of objects and describe them according to a common protocol. Only statistical testing, however, can answer the central question: do the identified morphological features recur across different classes of objects more frequently and consistently than would be expected by chance? It is this question that transfers the Unified Matrix of the Universe hypothesis from the realm of visual persuasiveness to that of testable research.

It is essential to understand that what must be tested is not the subjective resemblance between images, but the frequency and consistency with which particular features recur. A scientific conclusion cannot be based solely upon the impression that a nebula 'resembles' a flower, a valley 'resembles' a leaf or a bas-relief 'resembles' a scheme depicting the opening of grain. Such an impression may be powerful, but it depends upon the choice of images, viewing angle, contrast, processing, the observer's expectations and the inherent tendency of the human mind to perceive familiar patterns.

Statistical testing requires a different approach: features must be defined in advance, measured across a large corpus of objects, compared with control groups and assessed to determine whether the results are robust.

The first step in statistical testing is the formulation of a testable hypothesis. It must be specific. For example: 'In radial-layered objects from different BIO–GEO–COS levels, the combination of a centre, concentric layers and an active edge occurs more frequently than in randomly selected objects from the same levels.' Alternatively: 'Branching structures at biological, hydrogeomorphological and cosmic levels possess similar distributions of nodes and branches across orders.' Or: 'Forms classified as opening types exhibit a higher degree of radiality and a

more complex edge than closed forms.' Such hypotheses can be tested. They do not immediately address the metaphysical meaning of the Matrix, but test its proposed morphological traces.

The second step is the definition of a null hypothesis. Scientific testing must allow for a negative result. A null hypothesis might state: 'The frequency of centredness, layering, radiality, branching or the active edge within the selected classes of objects does not differ from that found in a random or control sample.' Alternatively: 'The similarity of morphological parameters between objects from different levels does not exceed the similarity found within randomly constructed groups.' If the data do not permit such a null hypothesis to be rejected, the claim concerning recurring invariants must be reconsidered. If the differences are robust and statistically significant, the hypothesis receives empirical support at the level of comparative morphology.

The third step is the selection of control groups. Statistical testing is impossible without controls. If only specially selected flowers, nebulae, leaves, valleys and artefacts are compared, the result will be biased in favour of the hypothesis from the outset. Strong BIO–GEO–COS triads must therefore be compared with random triads. The triad 'flower — relief — nebula', for example, should be compared with sets of randomly selected biological, geological and cosmic objects. If the selected triad genuinely possesses more features in common than the majority of random triads, this will constitute evidence in its favour. If not, its visual persuasiveness will prove insufficient.

Control groups may be of several types:

- The first type consists of randomly selected objects from within the same levels: random leaves, random relief forms and random nebulae.
- The second type consists of objects from another morphological class: radial forms may be compared with elongated ones, branching forms with compact ones, and layered forms with chaotic ones.
- The third type consists of artificially generated random forms, such as random contours or networks, against which natural structures can be compared.
- The fourth type consists of negative cultural examples: artefacts or ornaments without a pronounced centre, axis or layering.

Only through such comparisons is it possible to determine how specific the features truly are.

The fourth step is the quantitative annotation of features. Every object in the database must be described according to the same features discussed in the preceding section: centre, axis, symmetry, radiality, layering, branching, edge parameters, fractal dimension, repetition of elements, nesting across scales and the relationship between centre and periphery. Frequency tables may then be constructed. What percentage of BIO objects possess a pronounced centre? How many GEO objects exhibit layering? How many COS objects possess an active edge? How many CULT objects display radial symmetry? Which features most frequently occur together? Which combinations are rare?

It is especially important to test combinations rather than individual features. A single centre or circle occurs too frequently to provide strong evidence. A combination of centredness, radiality, layering, an active edge and repetition across scales, however, constitutes a more specific structure. Statistical analysis should therefore operate with morphological profiles. A radial-layered profile, for example, might comprise a centre, two or more layers, a radial distribution of elements, a complex edge and a pronounced periphery. It would then be possible to test how

frequently this profile occurs at different levels and how effectively it distinguishes the selected class of objects from a random set.

The fifth step is the assessment of statistical significance. If a feature occurs more frequently in the study group than in the control group, it is necessary to determine whether the difference is substantial or could have arisen by chance. Different methods may be used depending upon the type of data: tests comparing frequencies, distribution analysis, non-parametric tests, permutation tests, bootstrap estimates, correlation analysis, clustering and regression models. The particular method will depend upon the structure of the database, sample size, feature type and research question. The essential point is that the conclusion must be based upon a testable procedure rather than an impression.

Statistical significance alone, however, is insufficient. Effect size must also be assessed. In a large database, even small differences may prove statistically significant while remaining practically unimportant. It is therefore necessary to ask: how great are the differences between the groups? How consistently is the feature manifested? What is the magnitude of the difference? If radiality occurs in 52 per cent of the objects in one group and 49 per cent of those in the control group, for example, the difference may be statistically detectable but weak in substantive terms. If a radial-layered profile occurs in 70 per cent of the selected triads and only 15 per cent of the random triads, the result is considerably stronger.

The sixth step is reproducibility testing. A single analysis of a single database should not be regarded as definitive. It is necessary to determine whether the results remain stable when the image set, segmentation method, algorithmic parameters, composition of the expert group, scale of analysis or contour-detection thresholds are changed. If the conclusion that particular features recur is preserved under different conditions, it becomes stronger. If it disappears following a minor modification of the procedure, it must be treated cautiously. Reproducibility is especially important for the Unified Matrix of the Universe hypothesis because it protects the research from accusations of selecting only favourable examples.

The seventh step is independent expert annotation. Many formal features contain an element of interpretation. One researcher may perceive an active edge where another sees merely an irregular contour. One may identify a single centre, while another identifies several. One may regard a structure as layered, while another considers it chaotic. Features should therefore be annotated by several independent experts wherever possible. The agreement between their assessments can then be measured. If agreement is high, the feature may be considered reliable. If it is low, the feature must be defined more precisely or replaced with a more formal parameter.

The eighth step is blind testing. To reduce the influence of expectations, experts may be shown images without being told which hypothesis they relate to or which objects are supposed to be ‘similar’. An expert might, for example, receive a set of BIO, GEO, COS and CULT images in random order and annotate their features. The researcher would then examine whether the objects group themselves according to the proposed morphological types. Such an approach helps to reduce confirmation bias, in which researchers perceive precisely what they expect or wish to see.

The ninth step is to compare selected triads with random triads. The method of visual triads was proposed as an important research instrument, but it must be formalised for scientific testing. Each triad might receive a morphological similarity score based upon predetermined features: centredness, radiality, layering, branching, edge complexity, fractal dimension and axial organisation. Thousands of random triads could then be constructed from the BIO–GEO–COS

database. If an author-selected triad scores higher than 95 per cent of the random triads, it may be regarded as demonstrating strong morphological comparability. If it lies near the middle of the distribution, its visual persuasiveness is insufficient.

The tenth step is cluster analysis. Once objects have been described through a set of features, it becomes possible to examine how they group together without imposing the author's classification in advance. An algorithm might, for example, identify a cluster of radial-layered forms containing flowers, certain nebulae, crop circles and mandalas. Alternatively, it might identify a cluster of axial-network forms containing leaves, river networks, roots and filamentary structures. If such clusters emerge independently of the levels from which the objects originate, this will constitute an interesting result. If the objects group themselves only according to their origin—biological objects separately from geological and cosmic ones—the hypothesis of cross-level morphological invariants will require refinement.

The eleventh step is the analysis of correlations between features. It is possible, for example, to test whether radiality is associated with centredness, layering with an active edge, branching with fractal dimension, an axis with hierarchical organisation, or repetition of elements with symmetry. If particular features frequently occur together, this may indicate the existence of stable morphological complexes. It is important not merely to establish that a centre occurs frequently, but to understand which other features combine with it to form a structure. The Matrix would then be described not through isolated features, but through configurations of interrelated features.

The twelfth step is the comparison of natural and cultural forms. Cultural forms should not be used as direct natural evidence for the hypothesis, but their morphological profiles may be compared with those of natural forms. It would be possible, for example, to test whether sacred geometries employ centres, layers, radiality and symmetry more frequently than randomly selected decorative forms. Lotus schemes could be compared with actual flowers. Crop circles could be assessed to determine how closely they correspond to radial-layered natural structures in formal terms. Such analysis would reveal which natural invariants culture selects and intensifies.

It is important to remember that cultural forms are often more regular than natural ones. The Sri Yantra or a mandala may possess greater symmetry than a real flower. A crop circle may have more precise geometry than a natural rosette. An ornament may repeat an element exactly, whereas a plant repeats it with variation. Statistical analysis must therefore distinguish between natural and cultural regularity. If a cultural form resembles a natural one in terms of centredness and radiality but exceeds it in ideal symmetry, this is not an error but an important result: culture idealises a natural invariant.

The thirteenth step is to test the stability of features within classes. If every flower in the sample possesses radiality, for example, this is to be expected. The question is which types of radiality occur, how many layers are present, how much the petals vary and what form the active edge takes. If nebulae display similar features only within a small subgroup, this must be recorded. If river networks consistently exhibit hierarchical branching, this represents one kind of result. If cosmic filaments possess a network structure without a tree-like hierarchy, this represents another. Statistics must reveal not only similarity, but also the limits of that similarity.

The fourteenth step is the testing of alternative explanations. If similar morphological features are discovered, this does not necessarily mean that a Unified Matrix exists in a strong ontological sense. Other explanations are possible: similar mathematical constraints, optimisation of flows,

energy minimisation, growth mechanics, the physical limits of a material, a cognitive preference for symmetry, cultural stylisation or image-selection effects. A serious hypothesis must not ignore alternatives, but compare itself with them. Statistical testing may demonstrate that a regularity exists, but its explanation remains a subject for theoretical discussion.

The fifteenth step is to distinguish correlation from causation. If a leaf, river network and cosmic filamentary structure possess similar branching parameters, this does not mean that they originated through the same cause. Correlation between features indicates morphological comparability, but does not prove a common mechanism. This distinction is especially important within the Unified Matrix hypothesis. The Matrix should not be understood as a crude assertion that the same physical process operates in every object. It is more accurate to speak of the recurrence of formal relationships that may arise through different mechanisms. Statistical testing may confirm the recurrence of such relationships, but must not automatically transform this result into evidence of a single cause.

The sixteenth step is the assessment of predictive power. A more developed version of the hypothesis should not merely explain examples that have already been selected, but should also predict new ones. If an object has a closed central form and signs of incipient opening, for example, one might expect an active edge or layered periphery to emerge in its developed state. If a structure belongs to the axial-network type, a particular distribution of branches might be expected. If a cultural form employs the lotus motif, a centre, layers, radiality and recurring petals might be predicted. Such predictions can be tested on new data. Predictive capacity is an important criterion of a hypothesis's strength.

The seventeenth step is testing on new samples. Once a classification and its parameters have been developed using one image corpus, they must be applied to another corpus that was not used to create the model. This will help to prevent overfitting, in which a scheme describes only the material upon which it was constructed. If a classification of radial-layered forms was developed using flowers, nebulae and mandalas, for example, it might be tested on marine organisms, geological ring structures and new field diagrams. If it continues to perform successfully, the hypothesis is strengthened. If not, the classification must be refined.

The eighteenth step is the assessment of the probability of coincidental similarity. Human perception tends to recognise familiar forms within random structures. This phenomenon is especially important to the present research because visual analogies can be deceptive. Statistics must help to answer the question: how probable is it that the selected features coincided by chance? Permutation tests, random sets and simulations of random contours and networks may be used for this purpose. If the proposed invariants occur substantially more frequently in the objects under investigation than in random models, this supports the hypothesis. If random forms produce equivalent results, the hypothesis is weakened.

The nineteenth step is the construction of a scale indicating the strength of correspondence to the Matrix. Objects should not be required either to correspond completely to the hypothesis or not to correspond at all. A graded scale would be more reasonable: strong correspondence, moderate correspondence, weak correspondence and no correspondence. Strong correspondence might indicate the presence of several independent features: centre, axis, layers, radiality, active edge and repetition. Moderate correspondence would indicate the presence of some of these features. Weak correspondence would indicate only one or two common features. No correspondence would indicate the absence of a structural relationship.

Such a scale will avoid an artificial binary division and demonstrate that the Matrix manifests itself not as an absolute scheme, but as a degree of morphological organisation.

The twentieth step is the visualisation of results. Statistical testing should be presented not only through tables, but also through comprehensible diagrams. These might include charts showing feature frequencies, cluster maps, similarity matrices, correlation graphs, distributions of fractal dimensions, and comparisons between author-selected and random triads. Such visualisations would help the reader see where the hypothesis receives support and where it encounters limitations. It is important that visualisation should not be decorative, but should communicate the results of testing.

The illustration accompanying this section might take the form of a statistical testing scheme (*Fig. 4*). It could show the path from the image database to features, from features to a table, from the table to comparison with a control group, and from comparison to the assessment of statistical significance and effect size.

The distinction between subjective resemblance and testable similarity could also be shown: two images would be accompanied not merely by the statement ‘similar’, but by a set of measured features and a final morphological similarity score. Such an illustration would be methodologically important because it would demonstrate how the hypothesis becomes testable.

Statistical testing must also account for multiple comparisons. If a researcher tests dozens of features across hundreds of objects, some correspondences may arise by chance. Corrections or more stringent criteria must therefore be applied to prevent accidental results from being declared significant. This is especially important for a hypothesis that works with a large number of forms and features. The wider the field of analysis, the greater the risk of false correspondences. Statistics must not merely seek confirmation, but also protect the research from overinterpretation.

Another important question is the relationship between qualitative and quantitative analysis. Statistics should not completely displace a substantive understanding of form. Two objects may possess the same fractal dimension while having entirely different structures. Alternatively, they may have the same number of layers but differ in the manner in which they unfold. Quantitative results must therefore be interpreted together with visual, morphological and contextual assessment. Statistics disciplines interpretation, but does not replace it completely. This is particularly important for cultural forms, in which meaning and context are highly significant.

At the same time, qualitative interpretation must not ignore statistics. If an author believes a particular motif to be universal, but the database shows that it occurs rarely or only in selected examples, the hypothesis must be reconsidered. If statistics demonstrate that certain features recur consistently, the philosophical interpretation acquires a firmer foundation.

The correct path is therefore a dialogue between qualitative and quantitative analysis: a form is described, measured and compared, and is only then interpreted. It is particularly important for this chapter to emphasise that scientific testing is not required to confirm the entire hypothesis at once. It is possible that only certain parts of it will be supported. Branching structures may prove to constitute a stable cross-level family, while radial-layered forms may be more limited. Cultural forms may frequently intensify centredness and symmetry, while natural forms exhibit greater variation. The fractal complexity of an edge may prove to be a strong feature for geological and biological objects but a weak one for cosmic images.

Such partial results do not constitute failure. They help to define the hypothesis's domain of applicability more precisely. The scientific maturity of a hypothesis lies precisely in its willingness to be refined. If statistical testing shows certain visual analogies to be weak, they should be removed or reclassified as figurative. If some features prove too general, they should be replaced with more precise ones. If certain groups of objects do not correspond to the expected scheme, the reasons must be investigated.

The Unified Matrix of the Universe hypothesis will become stronger not when it declares every form to be evidence in its favour, but when it learns to distinguish between strong, weak and false correspondences. In this sense, statistical testing is not a threat to the hypothesis, but a necessary stage in its development. It makes it possible to distinguish invariants from coincidences, strong triads from weak ones, structural similarity from visual impression, and philosophical interpretation from measurable features.

Statistics can show where the hypothesis possesses an empirical foundation and where it remains metaphorical. This is essential to any serious scientific discussion. Without statistical testing, the hypothesis will remain an elegant system of images. With such testing, it may become a programme of comparative morphology.

The concluding principle may be formulated as follows: what must be tested is not whether images are 'similar' as a whole, but whether they contain recurring, predetermined and measurable formal features. Centre, axis, symmetry, layers, branching, fractal dimension, active edge, repetition, radiality and nesting across scales must be represented as data. These data must be compared with control groups and random sets and subjected to independent annotation. Only then will it be possible to speak of scientific support for the hypothesis or of its limitations.

Thus, statistical testing completes the methodological transition undertaken in this chapter. Testable propositions have been distinguished from philosophical and figurative ones. Morphometry has provided methods for measuring form. Fractal analysis has supplied instruments for assessing scale-dependent complexity. The comparative image database has created the foundation of a data corpus. Statistics must now demonstrate how consistently the features regarded by the hypothesis as traces of the Unified Matrix actually recur. If this programme is implemented, the hypothesis will be able to move beyond aesthetic persuasiveness and become a subject of interdisciplinary scientific discussion.

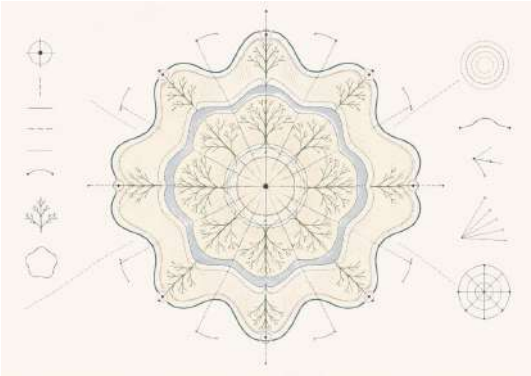

Fig. 1. Morphometric Profile of Form: Centre, Axis, Symmetry, Contour, Edge Curvature, Layers, Branching, Repetition of Elements, and the Centre-to-Periphery Relationship as Measurable Features

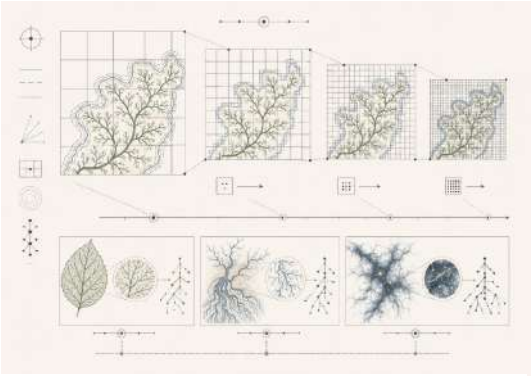

Fig. 2. Fractal Analysis of Form: Box-Counting Method, Scale Invariance, Edge Complexity, and Comparison of Branching Structures across Different Levels

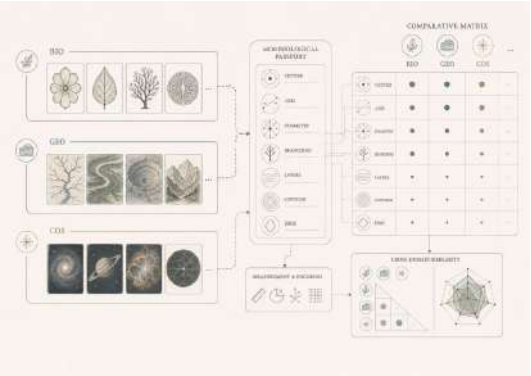

Fig. 3. Comparative BIO–GEO–COS Database: Image Corpus, Unified Morphological Profile, Feature Annotation, Measurements, and a Comparative Matrix of Objects across Different Levels

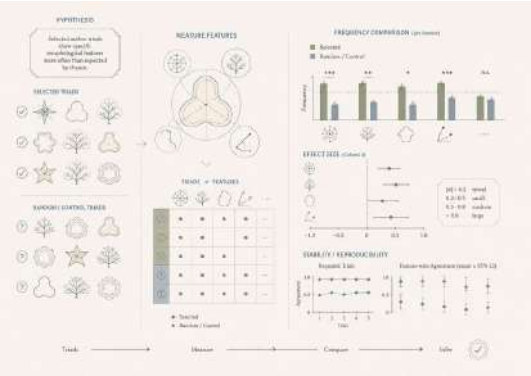

Fig. 4. Statistical Testing of the Hypothesis: Comparison of Author-Selected and Random Triads, Feature Frequencies, Control Groups, Effect Size, and Robustness of Morphological Correspondences

Chapter Twenty-Three

Numerical Modelling of the Matrix

23.1. Reaction–Diffusion Models

The transition to numerical modelling constitutes a fundamentally important stage in the development of the Unified Matrix of the Universe hypothesis. While the preceding chapters focused primarily upon comparative morphology, cultural analogies, philosophical interpretation and the possibilities of morphometric testing, the next step must now be taken: an attempt to reproduce certain types of form not only descriptively, but also within a computational environment. In other words, the following question arises: can simple mathematical rules be defined that, under particular parameter values, generate structures resembling the spots, stripes, spirals, waves, radial distributions and other morphological patterns repeatedly discussed throughout this book? Reaction–diffusion models, and particularly Turing-type models, constitute one of the most productive approaches to such modelling.

The reaction–diffusion approach occupies a special place within the theory of morphogenesis because it demonstrates how complex order can arise not through external design, but through the interaction of several simple processes within the system itself. In its most general form, it concerns a medium containing at least two interacting components. One may locally amplify a particular tendency, while the other suppresses it and simultaneously spreads more rapidly through space. It is precisely this combination of local activation and broader inhibition that creates the conditions for the emergence of a spatially self-organised pattern. As a result, stable spots, stripes, grids, labyrinthine structures, concentric rings, waves and, in some cases, spiral or radial forms may arise against an initially almost homogeneous background.

Historically, this field was founded upon the ideas of Alan Turing, who demonstrated that morphogenesis cannot be reduced solely to a predetermined plan within an organism. He proposed that form generation should be regarded as a dynamic process in which chemical or quasi-chemical agents interact and diffuse, producing stable spatial irregularities. This was an exceptionally important step because it transferred the question of the origin of form from the realm of purely descriptive analysis into that of dynamics and mathematical modelling. This is especially significant in the context of the present study: if the Unified Matrix is understood as a system of formative invariants, reaction–diffusion models provide one possible mechanism through which such invariants might manifest themselves.

A methodological boundary must be emphasised from the outset. A reaction–diffusion model does not in itself prove the Unified Matrix hypothesis. It does not confirm the existence of a universal ontological principle merely because it can generate beautiful and diverse patterns. It does, however, demonstrate something else of considerable importance: complex morphology may emerge from relatively simple local rules of interaction. This means that the observed recurrence of forms—spots, stripes, spirals, concentric zones and radial structures—may

possess not only a descriptive but also a dynamic foundation. This possibility makes reaction–diffusion models a natural subject for the first computational chapter.

One of the most important advantages of such models is that they do not prescribe a completed form in advance. The researcher does not manually draw a flower, shell, striped ornament or spiral structure. Instead, a system of equations or discrete rules is specified to determine how concentrations change over time and space, and the form emerges as the result of the computational process. This is especially important to the Matrix hypothesis because the book has repeatedly emphasised the distinction between static similarity and the dynamic becoming of form. Reaction–diffusion models make it possible to speak not only of forms that resemble one another, but also of forms that may result from a similar logic of self-organisation: local amplification, spatial propagation, inhibition, boundary, phase transition and pattern stabilisation.

In its most general form, a reaction–diffusion system may be written as a set of coupled equations for two or more variables dependent upon spatial coordinates and time. The first part of the equations describes the reaction—that is, the local interaction between the components. The second part describes diffusion—that is, their spatial propagation. In continuous form, this is most commonly represented as a system of partial differential equations. For the purposes of the present study, however, it is not the complete mathematical formulation of every possible equation that matters most, but an understanding of the underlying structural idea: a homogeneous state of the system may become unstable, and a pattern may emerge from this instability.

If this principle is translated into the morphological language of the study, a reaction–diffusion model may be described as a mechanism of transition from the concealed to the manifested. During the initial phase, the medium appears homogeneous and therefore corresponds morphologically to a state of potentiality. Local differences then emerge, particular regions intensify, boundaries form, centres become distinguishable and recurring elements arise. The system ultimately develops into a pattern in which areas of high and low activity, spots and intervals, stripes and boundaries, rings and peripheral regions can be distinguished. This makes the reaction–diffusion approach particularly relevant to the A–B–C–D model, to which the chapter will return later. It is already apparent that numerical modelling may be understood as a computational analogue of a morphogenetic transition.

The best-known visual results of reaction–diffusion models are spotted and striped structures. In biology, such patterns are frequently associated with animal coloration, pigment distribution, tissue organisation and the localisation of cellular processes. For the purposes of the present study, however, the significance of spots and stripes is broader. A spot is not merely a coloured area; it is a localised centre of activity distinguished from its surroundings. A stripe is an elongated zone of stable differentiation. Morphologically, a spot may be compared with a germinal centre, an island of concentration, a seed node or the nucleus of a future structure. A stripe may be compared with axial organisation, a wave of tension, a fold, a zone of differentiation, a growth boundary or an elongated line of form. Even the simplest Turing patterns therefore correspond to morphological invariants identified earlier in the book.

Transitions between different types of patterns are especially interesting. As parameters change, the same model may first generate isolated spots, then their fusion, followed by short stripes, extended labyrinthine lines and, finally, almost ring-shaped structures. This is important not only mathematically, but also morphologically. Form proves not to be a rigidly defined category; it can

pass gradually from one regime into another. In the terminology of the Matrix, this means that the structure of the world may need to be conceived not as a fixed collection of images, but as a space of morphogenetic regimes. Spots, stripes, spirals, waves and radial structures would then appear not as accidental forms, but as stable regions within the system's morphogenetic behaviour.

Labyrinthine patterns merit particular attention. Visually, they resemble winding stripes, complex folded surfaces, fracture-like or wave-like structures and, at times, ornamental lines. Their importance to the study lies in their ability to connect biological, geological and cultural dimensions. In biological tissues, such patterns may manifest chemical differentiation; in geology, similar forms recall folding, erosional lines or networks of stress; and in culture, they resemble the zigzag and undulating motifs of artefacts discussed in Chapter 18. The value of the reaction–diffusion model here lies in its demonstration that even winding complexity may arise not chaotically, but as a regular result of the interaction between local growth and spatial constraint.

Ring-shaped and radial structures are no less important. Although classical Turing systems are more often discussed in connection with spots and stripes, appropriate initial conditions, domain geometry and parameter selection may produce concentric waves, ring-shaped zones, radial haloes and centrifugally organised patterns. This is extremely significant to the Unified Matrix hypothesis because radiality has been a key motif throughout many chapters: the flower, bud, lotus, nebula, mandala, crop circle, centrally organised artefact and planetary shell are all united by the motif of centre and periphery. When a reaction–diffusion model reproduces radial patterns, it becomes an especially valuable computational bridge between biological growth, cultural geometry and the general morphogenetic language of the study.

The emergence of radial structures depends not only upon the reaction coefficients themselves, but also upon the shape of the domain in which the modelling takes place. If the calculation is performed on a square grid, the system may tend towards one type of pattern; if it is performed within a circular or annular domain, it may tend towards another. This has important philosophical and morphological implications. It demonstrates that form arises not only from internal reaction rules, but also from the relationship between the process and its boundary.

The boundary is one of the central themes of the entire study. The shell of a seed, the edge of a leaf, the edge of a petal, the boundary of a nebula, the margin of a bas-relief and the periphery of a crop circle are all active zones rather than mere terminations of form. Reaction–diffusion models confirm this computationally: the character of the boundary affects the resulting pattern, which means that form is always related to the limit of its unfolding.

The concept of the active edge is relevant here. In previous chapters, it was used as a morphological designation for the zone in which a form interacts with its environment and displays its greatest structural complexity. In reaction–diffusion models, an analogue of the active edge may be found in an area with a steep concentration gradient, the front of a propagating wave, a phase-transition zone or the boundary between locally activated and inhibited regions. This is an important point because it translates the figurative language of the study into the language of dynamics. The active edge is no longer merely a metaphor. It can be understood as a region of nonlinear transition in which the system is most sensitive to its parameters and where the pattern takes shape most intensively.

Spiral waves are of particular interest. They do not arise in every model or under all parameter values, but within certain classes of excitable media and reaction–diffusion systems, the spiral is one of the most stable and visually striking patterns. Morphologically, the spiral occupies a

special position within this book: it has already been examined as a form connecting biological, geological and cosmic levels. Spiral growth, curls, cyclonic structures, galactic arms, coiled ornaments and even certain cultural and ritual signs form a series of structures in which movement and form are inseparable. If a numerical model can generate a spiral without its contour being imposed manually, this means that the spiral need not necessarily be the product of a special symbolic choice; it may be a natural mode of systemic self-organisation.

The spiral wave is especially important because it combines a centre, rotation, a propagating front and preserved order. In the terminology of the Matrix, it is one of the most expressive images of unfolding. If a spot is a local centre and a stripe is an elongated regime of differentiation, then a spiral is a dynamic form in which the centre not only exists, but also generates movement. This suggests that certain cultural and natural spirals may be understood as morphological traces of processes in which internal order propagates not only radially, but rotationally. This does not, of course, mean that every spiral in the world has a reaction–diffusion origin. As a computational analogue, however, the spiral wave demonstrates that the spiral form can emerge naturally from simple interacting rules.

One of the most important properties of reaction–diffusion models is their sensitivity to parameters. A small change in reaction or diffusion coefficients may radically alter the type of pattern produced. This has a dual significance. On the one hand, it complicates the task: form proves highly sensitive to the selection of numerical parameters, requiring systematic investigation rather than arbitrary adjustment. On the other hand, this very sensitivity makes the model valuable to the Matrix hypothesis. It demonstrates that the same class of dynamics can produce diverse forms when environmental conditions, propagation rates, component interactions and boundary conditions are varied. In other words, the diversity of the world may not contradict the Matrix, but may instead result from variation among its parametric regimes.

This approach helps to overcome the potential misconception that the Unified Matrix should produce the same form everywhere. If the hypothesis is to claim scientific seriousness, it must speak not of the literal repetition of a pattern, but of the recurrence of principles. Reaction–diffusion models demonstrate precisely this. The same fundamental equations produce spots in one regime, stripes in another, and labyrinths, waves or spirals in others. Universality may therefore belong not to a completed geometry, but to a class of processes capable of transitioning between several stable organisational regimes.

Within the present chapter, reaction–diffusion models should primarily be regarded as generators of fundamental morphological motifs. These include:

- Localised centres of activity.
- Striped zones.
- Alternating active and passive regions.
- Wave fronts.
- Concentric rings.
- Radial distributions.
- Spiral dynamic regimes.

Each of these motifs can subsequently be compared with the morphological families identified earlier in the book. Localised spots, for example, correspond to the seed or germinal principle; stripes, to wave-like and zigzag structures; concentric zones, to shells, layers and mandala-like

schemes; radial patterns, to the flower, lotus, rosette and opening; and spirals, to growth dynamics and cosmic vortices.

Particular attention should be paid to the system's initial state. In most reaction–diffusion models, the pattern emerges from an almost homogeneous medium into which only minor perturbations have been introduced. These initial perturbations play an important role: they become the points from which the system begins to unfold differences. This recalls one of the study's central ideas—that concealed form does not emerge from absolute emptiness, but from a potentially heterogeneous medium containing the conditions for future differentiation. From a computational standpoint, a perturbation is a small random variation; morphologically, it is the seed of a structure. Importantly, the subsequent pattern is determined not by the random noise itself, but by the laws of the system, which amplify certain differences and suppress others.

The reaction–diffusion model therefore makes it possible to pose the question of the relationship between chance and regularity in a new way. Many natural patterns appear either chaotic or, conversely, too beautiful to result from simple rules. The Turing approach demonstrates that both extremes are false. Random noise may serve as a trigger, but it is not the source of the final structure; a regular pattern need not have been drawn in advance. It may emerge through spontaneous self-organisation. This is an extremely important point for the Matrix hypothesis: order may be an internal property of a process rather than a design imposed from outside.

If such models are to be used as an instrument of future numerical research, several specific tasks must be undertaken:

1. It is necessary to determine which classes of reaction–diffusion equations are most suitable for modelling the particular forms relevant to the study.
2. The parameter space must be investigated systematically: which combinations of coefficients produce spots, which produce stripes, which produce rings and which produce spirals?
3. The visual pattern must be linked to measurable characteristics: the number of centres, average stripe length, degree of radiality, number of layers, edge curvature, fractal dimension of the contour and degree of symmetry.

Reaction–diffusion modelling can then be integrated with the morphometry and statistical testing discussed in the preceding chapter.

This means that a Turing model should not be regarded as a decorative generator of beautiful images, but as a source of data. If each parameter set produces an image that can subsequently be analysed morphometrically, an important sequence emerges: theory — computation — image — measurement — comparison. Along this path, the Matrix hypothesis gains the ability to move from describing completed natural forms to modelling a space of possible forms. The question will then become not merely 'Where in nature does a spot or radial structure occur?' but also 'Which dynamic conditions generate the corresponding pattern?'

A particularly promising direction is the comparison of reaction–diffusion patterns with the objects of BIO–GEO–COS triads. Spotted and radial-layered patterns, for example, may be compared with floral and shell-like structures; striped and labyrinthine patterns with geological folds, artefactual zigzags and certain surface patterns; and spiral patterns with biological and cosmic vortices. Such comparisons must, of course, remain cautious. A numerical model does not reproduce an entire real flower, landscape or nebula. It may, however, reproduce a

morphogenetic motif: a type of distribution, boundary or self-organisation. At this level, the comparison is methodologically valid.

The dimensionality of the model space also plays an important role. Most visually comprehensible reaction–diffusion patterns are constructed on a two-dimensional plane. This is convenient for analysis, illustration and comparison with images. Many of the forms examined in the study, however—the bud, fruit, stone, geode, planetary shell and three-dimensional lotus—are three-dimensional in nature. The further development of modelling must therefore provide for a transition from two-dimensional patterns to surfaces and volumes. At the initial stage, a two-dimensional model is useful because it demonstrates the principle by which activity is distributed across a surface. From the perspective of the Matrix, however, it will ultimately be important to investigate how the same mechanisms operate on curved shells and within spatially bounded bodies.

Reaction–diffusion systems also make it possible to introduce a temporal dimension into the analysis of form. In the preceding chapters, form was often examined as a completed result, although the process underlying it was continually emphasised. For the first time, a numerical model makes that process explicitly visible: one can observe how irregularities gradually emerge from an almost homogeneous medium, how centres intensify, how stripes elongate, how rings stabilise and how a spiral front rotates. This is exceptionally important to the philosophy of form underlying the study. The Matrix should be conceived not as a static table of images, but as a dynamic possibility of transitions. Reaction–diffusion modelling demonstrates clearly that form is a history, not merely a geometry.

This is why the present section may be regarded as the first computational approximation to the concept of a morphogenetic algorithm. Here, an algorithm does not mean discrete computer code in the narrow sense, but a sequence of rules according to which a system passes from one state to another. The Turing model demonstrates that such an algorithm may be structurally simple yet extraordinarily rich in its consequences. This is fundamental to the Unified Matrix hypothesis: if the world genuinely contains recurring morphological invariants, they may be connected not with an infinite collection of unique laws for every object, but with a limited number of generative schemes manifested in different media.

Scientific caution must nevertheless be maintained. It cannot be claimed that every spot on an animal’s skin, every floral ornament, every nebula or every spiral results specifically from Turing reaction–diffusion. Real systems are simultaneously affected by growth mechanics, genetic regulation, tissue geometry, external fields, material flows, stress gradients, gravity, turbulence, evolutionary constraints and many other factors. The reaction–diffusion model is valuable not because it explains everything, but because it demonstrates one fundamental class of mechanisms through which order can emerge spontaneously within a distributed medium. Its strength lies in demonstrating a principle, not in claiming to provide a universal explanation for every form.

In the subsequent development of the chapter, reaction–diffusion models may occupy the position of a foundational layer in the numerical modelling of the Matrix. They are best suited to analysing surface patterns and distribution fields. In the next section, L-systems will provide a more natural approach to growth, branching and tree-like structures. Fractal iterations will then prove useful for modelling self-similarity. Models of folding and opening will be examined thereafter. Reaction–diffusion models open the chapter, however, because they demonstrate the

most important point: morphological difference can arise even from a simple homogeneous medium, and difference is the first step towards any form.

Thus, reaction–diffusion models should be regarded as computational tools for investigating morphogenetic invariants. They make it possible to model spots, stripes, labyrinthine structures, waves, spirals and radial distributions. They demonstrate how local interaction and spatial propagation produce stable order. They connect the philosophical language of the study—centre, boundary, opening, active edge, layering and repetition—with mathematically formalisable dynamics. They do not prove the Unified Matrix hypothesis, but they make it more substantive by demonstrating that complex form can be understood as the result of a generative process rather than merely as an object of visual comparison.

Turing reaction–diffusion models therefore constitute the first natural step towards the numerical modelling of the Matrix because they reproduce fundamental morphological patterns—spots, stripes, spirals and radial structures—on the basis of simple local rules. Their significance to the Unified Matrix hypothesis lies not in confirming a universal meaning of form, but in demonstrating the possibility that order may be generated through self-organisation. They thereby open the way to the next level of research: the comparison of computationally generated structures with the morphological types already identified in the study's biological, geological, cosmic and cultural materials.

23.2. L-Systems and Growth Algorithms

Whereas reaction–diffusion models make it possible to simulate spots, stripes, waves, spirals and distributed patterns across a surface or field, L-systems open another path towards the numerical modelling of the Matrix: the path of growth algorithms. They are especially important where form arises not as a distribution of matter across a plane, but through the sequential development of a structure: a stem, branch, leaf, root, vein, tree, fractal plant, vascular network or tree-like ornament. In the context of the present study, L-systems may be regarded as one of the most expressive ways of demonstrating how a simple rule, applied repeatedly over time, generates a complex, hierarchical and self-similar form.

An L-system, or Lindenmayer system, is in its most general form a formal grammar of growth. It specifies an initial state and a set of transformation rules. At the first step, there is a simple string of symbols that may be understood as an initial form, axis, germ, stem or minimal structure. Replacement rules are then applied to each symbol. Following the first iteration, the string becomes more complex. After the second, its complexity increases further. After several repetitions, a short initial expression may produce a branching structure resembling a plant, bush, tree, coral, leaf venation or fractal ornament. The essential point is that this complexity is not drawn manually; it emerges through the repetition of rules.

This is exceptionally important to the Unified Matrix of the Universe hypothesis. The book has repeatedly emphasised that the Matrix should not be understood as a completed image mechanically copied by nature at different levels. It is considerably more productive to understand it as a generative principle—a set of relationships that produces different forms under different conditions. L-systems demonstrate precisely such generativity. They show that a tree can be described not as the sum of its individual branches, but as an algorithm of branching. A leaf can be described not only as a contour, but as a process through which veins are distributed.

A fractal plant may be represented as the iterative unfolding of the same structural operation at different scales.

Unlike reaction–diffusion models, in which the principal emphasis falls upon distributed field processes, L-systems operate through a sequence of growth. They express the idea of time particularly well. Each iteration constitutes a new stage. The initial state gradually develops into a complex form. L-systems may therefore be regarded as a numerical model of the transition from simple to complex, from axis to branching, from trunk to crown, from central vein to network, and from potential structure to unfolded morphology. This transition underlies many of the study's images: grain—shoot—plant—fruit; root—trunk—branches—leaves; centre—axis—branching—periphery.

The basic logic of an L-system can be described through four elements: an alphabet of symbols, an initial string, rewriting rules and a method of geometric interpretation. The alphabet defines a set of symbolic commands or elements. The initial string defines the starting state. Rewriting rules determine what each symbol becomes during the next step. Geometric interpretation translates the string of symbols into an image: move forwards, turn right, turn left, begin a branch, end a branch, alter thickness, alter length, or produce a leaf or flower. In this way, the formal string becomes a visible form.

A particularly well-known method of graphic interpretation employs so-called 'turtle graphics'. A notional point moves across a plane or through space: it advances, turns, saves its position, returns to the saved point and creates a branch. Within such a system, one symbol may represent forward growth, another a turn, a third the beginning of a lateral branch and a fourth its completion. After several iterations, a structure emerges in which each branch contains smaller branches and each smaller branch repeats the general principle. This makes L-systems especially convenient for modelling fractal plants.

The most important element of L-systems is repetition. This is not, however, the mechanical repetition of an identical fragment at a single scale. In a well-constructed growth model, repetition is accompanied by decreasing length, changing angles, branching, variations in thickness and the appearance of new levels. This is why such models can appear alive. The trunk is not simply copied; it generates branches. The branches generate smaller branches. The smaller branches generate shoots. The shoots may generate leaves. A hierarchy thus emerges. Morphologically, this is close to what the chapter on the World Tree described as axis, root, trunk, branches, crown and the self-similar propagation of form.

L-systems are especially well suited to modelling trees. In the simplest version, the model begins with a vertical line analogous to the trunk. At every step, the end of the line may produce two or more lateral branches at specified angles. Each new branch is shorter than its predecessor. After several iterations, a tree-like structure emerges. If the angle remains constant, the tree is more geometric. If the angle varies slightly, the form becomes more lifelike. If randomness, asymmetry, changes in thickness and the influence of 'tropism'—such as the tendency of branches to grow towards light or upwards—are introduced, the model begins to approximate actual plant morphology.

For the Matrix hypothesis, what matters here is the possibility of describing a tree through a set of parameters: branching angle, length-reduction coefficient, number of daughter branches, branching order, changes in thickness, probability of continued growth, degree of randomness, direction of primary growth and spatial constraints. These parameters may be compared with the morphometric features discussed in Chapter 22. If a real tree possesses a particular distribution

of branching angles and branch lengths, for example, an L-system may be configured to reproduce a similar morphological profile. The model then becomes not merely a beautiful illustration, but a testable approximation of a growth structure.

L-systems can model not only trees, but also leaves. A leaf generally possesses a central vein from which lateral veins emerge. In some leaves, the venation is pinnate; in others, palmate, reticulate, parallel or arcuate. A growth algorithm may begin with a principal axis, then add lateral lines at particular angles, followed by finer branches and finally connections or the contour of the leaf blade. It is possible to model not only venation, but also the leaf's contour: smooth, serrated, undulating, lobed, elongated or rounded. L-systems thus permit a transition from axis to network and from network to surface.

It is especially interesting to model a leaf as the conjunction of two processes: internal branching and external contour formation. In a real leaf, the veins do not exist separately from the blade. They support it, supply it, organise the distribution of matter and establish its internal architecture. The leaf's contour, in turn, constitutes an active edge through which the form interacts with its environment. This may be expressed in an L-system through two levels: first, the central and lateral network is constructed; then, an external edge forms around it. If the venation parameters and edge parameters are interrelated, a more organic model emerges. This is important to the Matrix because it presupposes a relationship among centre, network and periphery rather than their isolated existence.

L-systems are also particularly productive for modelling root systems. A root grows differently from a crown, but its morphological logic is likewise associated with branching, the exploration of space, resource distribution and environmental adaptation. A model may specify a primary root, lateral roots, changes of direction, random deviations, zones of greater density, reactions to obstacles, and decreasing thickness and length. The resulting structure may be compared with an actual root system, river network or crack pattern. Here again, an important idea of the study becomes apparent: different mechanisms may generate comparable network forms.

L-systems should not, however, be confined to botany. They may be applied to any tree-like or fractal-like structure. They can be used, for example, to model corals, vascular networks, bronchial trees, neural branching, lightning, cracks, deltas, channel systems, ornamental trees and decorative rosettes with branching. In many cases, of course, the L-system will not constitute a physically exact model, but a formal generative analogy. Such an analogy is useful provided it is not presented as a direct explanation. It demonstrates which simple rules are capable of generating a structure of the same morphological type.

In this sense, an L-system is not so much a model of a particular object as a model of a class of forms. One L-system might model 'tree-like propagation', another 'leaf venation', a third 'a symmetrical fractal crown' and a fourth 'asymmetrical branching under environmental influence'. This is especially important to the Unified Matrix hypothesis. The Matrix need not describe every tree or leaf in detail. It may describe an invariant class of relationships: axis, node, branch, order, reduction in scale, repetition and peripheral propagation. L-systems make this class computationally accessible.

There are several types of L-system. Deterministic L-systems employ one rule for each symbol and always produce the same result under identical conditions. They are useful for demonstrating the pure logic of growth, but often appear excessively geometric. Stochastic L-systems allow several alternative rules selected according to specified probabilities. They produce more lifelike, diverse and natural forms. Parametric L-systems introduce numerical

parameters such as length, angle, thickness, branch age, resource and growth rate. Context-sensitive L-systems take neighbouring elements into account. All of these variants may be useful at different levels of Matrix modelling.

Stochasticity is especially important for living forms. A real tree never reproduces an ideal geometric scheme in its entirety. Its branches deviate, some shoots fail to develop, parts of the structure are damaged, light and wind influence growth, and neighbouring plants restrict the available space. If a model contains no variability, it may appear artificial. If moderate randomness is introduced, the structure becomes more natural. This accords closely with the general idea of the study: the Matrix manifests itself not as a rigid template, but as an invariant expressed through variation. The algorithm establishes a direction, while randomness and environment create the individuality of the form.

Parametric L-systems permit especially refined modelling of growth. Each branch, for example, may be assigned a length, thickness, age, direction and resource level. During each iteration, the branch may grow, divide or cease developing according to these parameters. The model may account for decreasing branch length with increasing distance from the trunk, tapering, changes in angle, competition for space, gravity and a light gradient. Such a model already approaches biomechanical or ecological modelling, although it remains formal. This is important to the Matrix hypothesis because it makes it possible to connect an abstract growth algorithm with measurable characteristics of a real object.

L-systems also make it possible to model stages of development. Images can be preserved after every iteration:

- First iteration is a simple axis.
- Second iteration is the first branches.
- Third iteration is a branching structure.
- Fourth iteration is a complex crown.
- Fifth iteration is an almost fractal network.

This produces a visual sequence of growth. Such a sequence is especially valuable to the study because it presents form not as a final result, but as a process. In terms of the A–B–C–D model, the first stage may correspond to a closed or simple potential axis; the second, to the beginning of opening through branching; the third, to a complex differentiated structure; and the fourth, to peripheral propagation and the possibility of a new cycle through seeds, leaves or new growth nodes.

A direct correspondence between an L-system and the A–B–C–D model may be proposed:

- Stage A — the axiom, initial string, simple axis or germ of a structure.
- Stage B — the first branching rules, the emergence of lateral directions and the disruption of simplicity.
- Stage C — repeated iteration, an unfolded network, complex crown, leaf venation or fractal form.
- Stage D — the completion of growth at the given level, the formation of a periphery, leaves, fruits, seeds, new starting points or recurring modules.

This correspondence is not a strict biological law, but as a computational scheme it helps to represent the Matrix dynamically.

The concept of the node possesses particular significance. In L-systems, branching occurs at particular points. A node is a location at which the growth line changes regime: it continues, divides, creates a lateral branch, forms a leaf or ceases to develop. Morphologically, a node corresponds to a point at which form takes a decision. In a tree, it is the point from which a branch emerges. In a leaf, it is the point from which a lateral vein extends. In a river network, it is the point at which channels merge or divide. In a cultural ornament, it is the point at which a line changes direction. Within the Matrix model, a node may be understood as a local zone in which direction is selected. Through nodes, a simple axis becomes a network.

Branching angle is no less important. A small change in angle can substantially alter the resulting form. At acute angles, the structure becomes more vertical and elongated. At wider angles, it becomes more spreading and radial. With symmetrical angles, it becomes geometrically stable. With variable angles, it becomes more lifelike and asymmetrical. Branching angle is therefore one of the principal parameters of an L-system. It can be compared with real data: the angles of lateral leaf veins, tree branches, root divisions, delta channels or cracks. In this way, the growth algorithm is connected with morphometry.

The length-reduction coefficient is also highly significant. If daughter branches are almost equal in length to their parent branches, the structure rapidly fills space and may become dense. If their lengths decrease sharply, the form remains simpler and more open. If the coefficient varies from one level to the next, a more complex hierarchy emerges. In nature, scale reduction is one of the principal characteristics of branching systems. The trunk is thicker than a branch, the branch thicker than a shoot, and the shoot thicker than a petiole or vein. An L-system makes it possible to model this transition and subsequently compare it with real objects.

Line thickness must likewise be taken into account. A simple L-system often renders every branch with an identical line, but real forms possess a hierarchy of thickness. The principal axis is thicker, lateral branches are thinner and minor branches thinner stfig. Thickness may depend upon branching order, length, age or the number of daughter elements. Visually, this makes the model more realistic; morphologically, it makes it more meaningful. Thickness indicates resource distribution, stability, the direction of the principal flow and the relationship between centre and periphery. Within the Matrix, it corresponds to the distinction between the primary channel of form and its secondary branches.

Another important parameter is branching density. This indicates how many new branches emerge over a particular length or iteration. High density creates a thick crown, dense venation or complex network. Low density produces a sparser, more open structure. Density may remain constant or vary from centre to periphery. Close to the trunk, for example, branches may be fewer but larger; at the periphery, they may be more numerous but smaller. Such distributions frequently occur in real plant forms. L-systems make it possible to specify this regularity and test which parameters produce forms resembling actual morphological types.

An important extension is the inclusion of environmental constraints. A real plant does not grow in a vacuum. It is affected by light, gravity, available space, neighbouring objects, water and mechanical stress. Simple L-systems often omit the environment, but more complex growth algorithms can incorporate it. Branches may, for example, tend upwards, avoid intersections, turn towards a light source, cease growing upon reaching a boundary or grow more strongly into unoccupied space. This makes the model more realistic while simultaneously demonstrating how the Matrix interacts with its environment. A universal algorithm does not operate within an abstract void; it is realised through constraints.

This approach is especially important when comparing natural and cultural forms. A cultural ornament or graphic fractal tree may be perfectly symmetrical because it is not constrained by a real growth environment. A real tree is asymmetrical because it developed under particular conditions. An L-system can model both cases. If the parameters are strictly symmetrical, an ornamental form will result. If randomness and environmental constraints are introduced, a more natural form will emerge. This demonstrates that culture often idealises a growth algorithm by purifying it of environmental contingencies, whereas nature realises the same type of relationships through material and circumstance.

L-systems may also be useful for modelling sacred or decorative tree-like forms. The World Tree, ornamental plants, stylised branches, lotus structures, genealogical trees and architectural plant motifs may all be described as cultural transformations of a growth algorithm. In such forms, actual biology is often simplified, symmetrised and transformed into a sign. An L-system helps to reveal which elements are preserved: axis, branching, levels, repetition and periphery. This makes it a bridge between natural morphology and cultural symbolism.

It must nevertheless be emphasised once again that an L-system does not prove that real plants 'operate' according to precisely such a formal grammar. It is a model. Real plants involve genetic programmes, hormonal gradients, cell division, tissue mechanics, metabolism and interaction with the environment. An L-system simplifies these processes and translates them into the language of rules. Its value therefore lies not in biological completeness, but in morphogenetic clarity. It makes it possible to see how the repetition of a local rule generates a global structure.

At the present stage, this is entirely sufficient for the Unified Matrix hypothesis. The purpose of the numerical modelling of the Matrix is not immediately to create a complete physical and biological model of every object. Its purpose is to identify generative schemes. Reaction–diffusion models provide a scheme for field patterns. L-systems provide a scheme for growth and branching. Fractal iterations, which will be examined next, provide a scheme for self-similar complexification. Models of folding and opening will provide a scheme for the transition from a closed structure to an open one. Together, these models may form a computational language of the Matrix.

The integration of L-systems with morphometric analysis is especially promising. Once a form has been generated, its features can be measured: the number of branches, branching order, angles, lengths, fractal dimension, degree of asymmetry, node density, radiality and centre-to-periphery relationship. These parameters may then be compared with real objects from the BIO–GEO–COS database. If modelled structures occupy the same regions of morphological space as real ones, this will constitute an important result. If they differ, the model's parameters can be refined. In this way, the L-system becomes part of the testing programme rather than merely a visual demonstration.

The following research protocol may be proposed. First, a real object is selected, such as a leaf with pronounced venation or a tree of a particular type. Its morphometric parameters are then extracted: central axis, branching angles, number of orders, segment lengths, node density and contour. An L-system is subsequently constructed using parameters that approximate these values. Once the model image has been generated, it is subjected to a second morphometric analysis. Finally, the real and modelled profiles are compared. This approach makes it possible not merely to draw a similar-looking tree, but to test how accurately the growth algorithm reproduces its measurable structure.

Entire families of models may subsequently be constructed. These might include a ‘pinnate leaf’ family, a ‘palmate leaf’ family, a ‘dichotomous branching’ family, an ‘asymmetrical crown’ family, a ‘radial fractal plant’ family, a ‘root network’ family and a ‘tree-like ornament’ family. Parameter ranges could be specified for each family and then compared with natural and cultural objects. This would make it possible to speak not of isolated illustrations, but of a space of forms generated through growth rules.

The visual illustration accompanying this section should present the L-system as a growth algorithm (*Fig. 2*). It might depict the initial axiom as a simple vertical axis, followed by several iterations: the first branch, the second branching, the third level of branching, and a complex fractal crown or leaf network. Notional parameters could be shown alongside it: branching angle, length reduction, branching order, repetition of a module and growth from centre to periphery. The image should not be overloaded with formulas. It should communicate the principal idea clearly: a simple rule repeated several times generates a complex tree-like form.

Such an illustration would complement the illustration of reaction–diffusion models. The first demonstrates the self-organisation of a field pattern: spots, stripes, spirals and radial zones. The second demonstrates the growth of a structure over time: axis, branching, iterations, crown, leaf and fractal plant. Together, they would provide the reader with two distinct computational modes through which form can emerge. This is important to the present chapter because the Matrix should not be reduced to a single mathematical model. Different types of form require different generative mechanisms.

Ultimately, L-systems and growth algorithms make it possible to represent the Matrix as a grammar of morphogenesis. This grammar contains an initial state, rules of unfolding, iterations, nodes, angles, branches, levels, a periphery and a possible return to a new beginning. Such a grammar does not replace biology, geology or cultural history, but provides a common language for describing growth. It demonstrates that a complex tree-like form may result from the repeated application of a simple rule rather than from a unique manual construction. This is precisely what makes L-systems an important instrument for the numerical modelling of the Unified Matrix.

Thus, L-systems may be applied to the modelling of leaves, branching, fractal plants, root systems, tree-like structures and cultural images of growth. Their significance to the Unified Matrix hypothesis lies in their translation of morphological features—axis, node, branching, repetition, hierarchy, self-similarity, centre and periphery—into the language of computable rules. They do not prove the universality of the Matrix, but demonstrate how a simple grammar of growth can generate a complex form. L-systems should therefore be regarded as one of the principal instruments for the future numerical modelling of morphogenetic invariants.

23.3. Fractal Iterations

Fractal iterations represent another important approach to the numerical modelling of the Matrix. Whereas reaction–diffusion models demonstrate how spots, stripes, waves and spirals emerge within a distributed medium, and L-systems demonstrate growth, branching and tree-like organisation, fractal iterations reveal the most general principle of self-similar complexification: a simple rule, repeated many times, can generate an extraordinarily complex form. This is fundamentally important to the Unified Matrix hypothesis because many objects examined in the book—the tree, leaf, root, river network, crack, coastline, nebula, ornament, lotus rosette and

sacred diagram—display not only external complexity, but also the recurrence of a particular structural motif at different levels.

Iteration means the repetition of an operation. In numerical modelling, this may take the form of a simple procedure: begin with an initial form, modify it according to a specified rule, apply the same rule to the resulting form and then repeat the process once again. During the first few steps, the form may remain relatively simple, but after several iterations it acquires a new complexity. Additional elements, fine details, nested levels, self-similar structures, recurring edges and a hierarchy of scales emerge. This is especially important to the present study because the Matrix is conceived not as a static scheme, but as a generative principle capable of unfolding complexity from a minimal foundation.

Fractal iteration differs from simple mechanical copying. If the same element is merely repeated beside itself, an ornament or sequence is produced. Fractal logic is deeper: repetition occurs with changes in scale, position, orientation and, at times, thickness, colour, density or degree of branching. The large contains the small; the small repeats the principle of the large; the part resembles the whole without being entirely identical to it. In this sense, fractal iteration constitutes a numerical analogue of what previous chapters described as the self-similarity of form. A branch resembles a tree, a lateral vein resembles the principal vein, a tributary resembles the drainage network, a small crack repeats the logic of a large fault, and a petal repeats the general principle of opening.

The best-known mathematical fractals demonstrate how far this principle can extend. The Sierpiński triangle arises through the repeated removal of central regions. The Koch curve emerges through the repeated addition of the same angular fragment to every segment. The Mandelbrot set and Julia sets are produced through iterations of simple complex functions, yet generate visually extraordinarily intricate boundaries. Fractal trees and ferns may be constructed through recurring affine transformations. All these examples demonstrate one fundamental idea: formal complexity does not always require a complex rule. Sometimes, a simple rule applied many times is sufficient.

This idea is especially important to the Unified Matrix hypothesis. If different levels of the world exhibit similar morphological motifs, this does not necessarily mean that every motif was independently ‘created’ or ‘specified’. Certain classes of rules may naturally produce a limited set of stable forms: branching, the spiral, layering, the active edge, repetition, centred unfolding and a fractal periphery. Fractal iterations make it possible to model precisely such a situation. They demonstrate that diversity may result not from an infinite number of independent causes, but from the repeated application of a limited set of operations.

One of the simplest fractal principles is division. An initial form is divided into parts, each part is then divided again, and the process continues. A hierarchical structure may be produced in this way. If division is uniform, the structure remains strict and geometric. If division is accompanied by displacement, randomness or changing angles, the form becomes more natural. This principle may be compared with the growth of branches, leaf venation, the subdivision of drainage networks, fracture formation, crystallisation, and the distribution of blood vessels or nerve endings. In each case, a local operation of division creates a multilevel organisation through repetition.

Another important principle is addition. A new element is added to an initial line or surface at every step. A projection may, for example, be added to a straight line; projections may then be added to every resulting segment; and the process may continue. In this way, a complex edge is

formed. This is especially important to the study's analysis of the active edge. A coastline, leaf contour, petal edge, nebular boundary, crack or ornamental line may be regarded as a form in which complexity arises through the repeated elaboration of the boundary. Fractal iteration makes this process visible: a smooth edge becomes undulating, then irregular and finally multiscalar.

The third principle is branching. An initial line generates two or more smaller lines, each of which then generates further lines. This principle is close to that of L-systems, but in the context of fractal iterations it is considered more abstractly: the important element is not a botanical grammar of growth, but the repetition of branching at different scales. Such a model may produce a fractal tree, vascular network, lightning-like form, river basin, root system or notional cosmic filamentary structure. Here, branching acts as a universal means by which form spreads from a centre, axis or node into space.

The fourth principle is nesting. A form contains similar forms at smaller scales within itself. These may be nested triangles, circles, squares, petals, spirals, branches or networks. Nesting is especially important to sacred geometry and cultural schemes. The Sri Yantra, mandalas, lotus bands, ornaments and architectural plans are frequently constructed through recurring levels and the inclusion of smaller structures within larger ones. Nesting is also present in nature: shells, layers, annual rings, rows of flowers, scales, crystalline structures and geological strata. Fractal iteration makes it possible to model how one principle may be nested within another and how a whole becomes multilevel.

The fifth principle is rotation and scaling. If an element is not only reduced but also rotated, a spiral or rosette organisation emerges. At every step, the new element may be smaller than its predecessor and turned slightly in relation to it. After several iterations, a coiled form appears, resembling a curl, shell, galactic arm, spiral ornament or vortex structure. This is especially important within the context of the Matrix because the spiral combines repetition, scale, movement and centre. Fractal iteration demonstrates how a spiral may result from a simple recursive rule: reduce, rotate, repeat.

Recursion is the central concept of fractal modelling. Recursion means that a rule refers back to itself: a form is created through the repeated application of its own logic. Philosophically, this is exceptionally close to the idea of self-similarity. A part of a form is constructed in the same manner as the whole, but at a different scale. This is not merely a decorative technique, but a profound organisational principle. If the Matrix can indeed be described as a generative system, recursion constitutes one of its possible computational languages. It demonstrates how the same structural operation can create multiple levels.

Fractal iterations also make it possible to distinguish clearly between a rule and its result. The rule may be extremely concise, while the result is visually rich. This has important methodological implications. A complex form is often assumed to require a complex explanation. Numerical modelling, however, demonstrates that complexity may result from the repetition of a simple algorithm. For the Matrix hypothesis, this opens an important possibility: the universality of form may lie not in the correspondence of completed images, but in a limited number of rules that generate diverse morphological families when repeated and varied.

Caution is nevertheless required once again. A fractal model must not replace the actual mechanism through which an object originates. If a fractal iteration creates a structure resembling a leaf, this does not mean that the leaf is literally 'computed' according to that simple formula. If an iterative model resembles a river network, this does not invalidate hydrology, relief,

precipitation, erosion, tectonics or time. If a model resembles a nebula, it does not replace astrophysics. Numerical modelling provides a morphological analogue rather than a complete causal explanation. Its purpose is to demonstrate possible generative rules of form, not to appropriate every mechanism of nature.

Fractal iterations should therefore be used within the book as research instruments rather than as ready-made evidence. They make it possible to ask which simple rules can generate forms that are morphometrically close to real objects. Different variants of a fractal tree could, for example, be generated and compared with actual tree crowns. Fractal contours could be created and compared with coastlines or leaf edges. Spiral iterations could be constructed and compared with shells, galactic arms or ornamental curls. If the similarity is confirmed through measurement, the model acquires significance. If it is not, the model remains merely a visual analogy.

An important advantage of fractal iterations is their parametric nature. It is possible to modify the angle of rotation, scaling coefficient, number of branches, iteration depth, degree of randomness, displacement, density, curvature and spatial boundaries. By varying these parameters, the researcher obtains an entire space of forms. This space may then be compared with the morphological types described in the book. One scaling coefficient and angle might produce a compact rosette; another, an open spiral; a third, sparse branching; and a fourth, a dense fractal mass. Fractal iteration therefore generates not a single form, but a family of forms.

This is especially important to understanding diversity. If the Matrix were conceived as a single immutable design, it could not explain the richness of the world. If, however, it is understood as a parametric space of rules, diversity becomes natural. The same iterative principle may produce different results when its coefficients are changed. Fractal iteration thus demonstrates how unity and multiplicity can be related: the rule remains one, while the forms differ. This idea is particularly important to the philosophical dimension of the hypothesis.

Iteration depth is one of the key parameters. With only a few iterations, a form remains simple. As the number of steps increases, it becomes progressively more complex. Excessive depth, however, may produce extreme density, visual noise or the loss of a legible structure. Natural systems likewise possess limits to nesting across scales: a tree does not branch indefinitely, leaf venation has a limit, a coastline is constrained by material resolution, a nebula possesses physical scales and an ornament is limited by technique. In modelling, therefore, the aim should not be infinity, but the analysis of the range of iterations within which a form remains morphologically meaningful.

Fractal dimension may serve as a bridge between an iterative model and the analysis of real objects. The fractal dimension of the contour or network of a generated form may be calculated and compared with empirical data. If a model contour possesses a dimension close to that of a coastline or leaf edge, for example, this may provide a starting point for comparison. A single number, however, is insufficient. Symmetry, branching, the distribution of elements, curvature and the relationship between centre and periphery must also be compared. Fractal dimension is an important, but not the only, parameter of the Matrix.

Within the A–B–C–D model, fractal iterations may be interpreted as a process through which complexity gradually unfolds. Stage A corresponds to the initial form or rule: a point, line, simple triangle, circle, axis or seed of the algorithm. Stage B corresponds to the first modification: the emergence of a projection, branch, rotation, division or disruption of simplicity. Stage C corresponds to repeated iterations through which the form becomes complex, self-similar,

multilayered or branching. Stage D corresponds to the completion of the selected iteration depth and the emergence of a new scale, peripheral pattern or elements that may themselves become the beginning of a new cycle. Iteration therefore fits naturally into the morphogenetic logic of the study.

It is especially interesting that, in fractal models, stage D may become a new A rather than an ending. Once a complex structure has formed, one of its parts may be treated as a new initial form. A single branch of a fractal tree contains branches of its own and may itself be analysed as a smaller tree. A fragment of a contour may repeat the general character of the edge. One sector of a rosette may contain the same logic of opening as the rosette as a whole. This is self-similarity in action: the end of one level becomes the beginning of the next. In the philosophical language of the Matrix, this may be described as the transition from a completed form to a new potentiality.

Fractal iterations also help to explain the relationship between order and chaos. A fractal form may appear exceptionally complex, almost chaotic. Once its algorithm is known, however, it becomes clear that this complexity possesses an internal order. This corresponds closely to many natural structures:

- A branching crown appears chaotic, but possesses a regularity of growth.
- A river network appears random, but is governed by relief and flow.
- A coastline appears irregular, but possesses a scale-dependent structure.
- A cloud appears formless, but exhibits statistical regularities.

Fractal iterations provide a language for describing this intermediate state between strict geometry and complete randomness.

The introduction of randomness into iterative rules constitutes an important direction of research. Ideal mathematical fractals are often excessively regular. Natural forms possess variability. Stochastic fractal iterations may therefore be used, with each step slightly altering the angle, length, position, curvature or probability of branching. The form then preserves its general invariant while becoming lifelike and unique. This is especially important to the Matrix hypothesis because it must explain not only repetition, but also individuality. The same principle may manifest itself differently within every object.

If a fractal tree is constructed using identical angles and scaling coefficients, for example, it resembles an ideal scheme. If small random deviations are introduced, it begins to resemble a real crown. If an external directional influence such as light or wind is added, the tree becomes asymmetrical. If a spatial boundary is imposed, the crown begins to fill the available space. This demonstrates that the Matrix, environment and randomness may operate together. The Matrix establishes the invariant, the environment constrains development and randomness creates an individual trajectory.

Fractal iterations are also highly significant for cultural forms. Ornaments, mandalas, rosettes, sacred diagrams, architectural patterns and decorative motifs frequently employ the repetition of elements at different levels. Sometimes this takes the form of strict geometric iteration; at other times it is stylised. In culture, the fractal principle may be visually present without being mathematically conscious: a motif repeats, diminishes, rotates, nests, forms an edge or creates a network. This makes it possible to regard cultural forms as conscious or intuitive engagements with the same morphological invariants that are numerically modelled through iteration.

A cultural fractal should not, however, be identified with a mathematical one. An ornament may be repetitive without being strictly self-similar. A mandala may be nested without possessing a

fractal dimension in the strict sense. A lotus rosette may repeat petals without being recursive across infinitely many scales. It is therefore preferable to speak of fractal-like principles: repetition, nesting, hierarchy across scales and the self-similar motif. Such caution preserves scientific precision and prevents the term ‘fractal’ from becoming a universal metaphor.

Fractal iterations may be useful for modelling the active edge. Consider a simple circle. If small projections are added to its edge at every step, followed by projections at smaller scales and then smaller still, the edge becomes complex, undulating and multiscalar. Such a model may be compared with the contour of a leaf, petal, coastline, nebula, stone or ornament. The important parameters here include not only fractal dimension, but also the distribution of projections, their amplitude, regularity and direction, and their relationship to internal layers. This makes it possible to transform the concept of the active edge into an object of numerical modelling.

A distinct type of iterative model may be proposed for an ‘opening form’. An initial circle or ellipse gradually acquires projections; these projections then become petals; and the petals subsequently develop their own finer edges or veins. Such a model could provide a numerical approximation of the transition from bud to flower, from a closed circle to a lotus rosette or from a simple circumference to a sacred mandala. In this case, fractal iteration connects with the models of folding and opening to be considered in Section 23.4. It demonstrates how a closed form may gradually elaborate its edge and become a multilayered open structure.

Fractal iterations also make it possible to model shell-like organisation. A system of nested contours may be constructed in which every subsequent layer repeats the general character of the preceding one, but with changes of scale and form. This may resemble geological layers, annual rings, nebular shells, concentric crop circles, mandala-like structures, or bulb- and bud-shaped forms. Here, self-similarity is manifested not through branching, but through the repetition of shells. This is important to the Matrix because not all complexity is tree-like; some forms develop through layers.

Another possible type is the iterative network. Initial nodes are connected by lines; new nodes then appear upon every line; these are connected through secondary links; and further levels subsequently emerge. Such a model may be used to analyse vascular networks, drainage basins, cracks, cosmic filaments and ornamental meshes. Here, the central element is not the branch, but the connection. Form develops through an increasing number of nodes and relationships. This is especially important to a future version of the Matrix conceived not only as a geometric but also as a network system.

For practical modelling, a set of parameters must be specified. These include the initial form, transformation rule, scaling coefficient, angle of rotation, number of copies, iteration depth, probability of random deviation, degree of asymmetry, domain boundary, stopping rule, method of connecting elements, changes in thickness, changes in colour or density, and degree of smoothing. These parameters may then be linked to morphometric features. Iteration depth, for example, is associated with the number of levels; the scaling coefficient, with fractal dimension; the angle of rotation, with radiality or spirality; randomness, with edge asymmetry; and the number of copies, with branching or petal-like organisation.

This parametric approach makes it possible to construct a ‘Matrix space’. Different regions within this space correspond to different types of form. Low iteration depth and a small number of copies produce simple forms. High depth combined with moderate randomness produces nature-like branching. Regular rotation produces spirals. Radial repetition produces rosettes. Nested shells produce layered structures. Random additions to an edge produce fractal

contours. This space may be investigated numerically and visually and then compared with real objects from the BIO–GEO–COS database.

The visual illustration accompanying this section should demonstrate the principle of fractal iteration (*Fig. 3*). It might take the form of a sequence: a simple initial form, the first application of the rule, the second, the third and the resulting self-similar structure. Several types of iteration could be shown alongside one another: branching, edge complexification, spiral scaling and nested layers. The image should be clear and not overloaded with formulas. Its principal purpose is to demonstrate to the reader that complexity emerges through the repetition of a rule rather than through the manual addition of random details.

Such an illustration would be important. It would complement the reaction–diffusion patterns and L-systems by demonstrating a third generative mechanism: recursive self-similar complexification. Together, these three approaches would reveal different aspects of the numerical modelling of the Matrix: the distributed field, the grammar of growth and fractal iteration. Each possesses its own limitations, but collectively they form a foundation for future computational morphology.

The conclusion of this section may be formulated as follows. Fractal iterations demonstrate how simple rules can generate complex self-similar forms. They make it possible to model branching, edge complexification, nesting, spiral scaling, shell-like organisation and networks. Their significance to the Unified Matrix hypothesis lies in translating the idea that form recurs at different levels into the language of a computable process. They do not prove the universality of the Matrix, but they demonstrate that complexity, self-similarity and multilevel organisation may emerge from a minimal set of rules. Fractal iterations are therefore an essential element in the numerical modelling of morphogenetic invariants.

23.4. Models of Folding and Opening

Following the discussion of reaction–diffusion models, L-systems and fractal iterations, it is necessary to turn to another type of numerical modelling that is especially important to the Unified Matrix of the Universe hypothesis: models of folding and opening. In previous chapters, the book repeatedly addressed the images of grain, bud, shell, seed, stone, planetary structure, lotus, flower, artefact and sacred geometry. In every case, it is not only the completed appearance of the form that matters, but also the transition: from closed to open, from compressed to unfolded, from internal to external, and from potential to manifested. It is precisely this transition that models of folding and opening should attempt to describe.

The fold is one of the most fundamental morphological operations. It enables a large surface or complex structure to be held temporarily within a small volume. A leaf may be folded within a bud. Petals may be compressed within a flower bud. A seed contains a future form in a concealed state. Soft tissue may form folds as it grows. Geological strata fold under pressure. A shell may crumple, become stressed, fracture and then open. Even cultural forms—scrolls, fans, folded ornaments, architectural domes and lotus rosettes—frequently employ the principle of concealed and unfolded volume. The fold should therefore be regarded not as a particular deformation, but as one of the principal modes through which form exists in time.

Morphologically, the fold unites two opposing tendencies: compression and the possibility of opening. While a form remains folded, its complete structure is invisible. Its internal layers are concealed, its periphery is gathered together, its contours overlap and its potential area is contained within a smaller shell. This concealment does not, however, signify the absence of form. On the contrary, a fold may contain an order that becomes visible only after opening. A bud is not a chaotic clump of petals. A seed is not an empty point. A rolled leaf is not a formless mass. Their future structure is already present, but remains in a state of morphological compression.

This is especially important to the Unified Matrix hypothesis. If the Matrix is understood as a generative principle, it must describe not only expansion, branching and fractal complexification, but also a phase of concealed preparedness. Form does not always begin its existence as an open surface or visible network. It is often first assembled, packed, rolled, protected and concentrated. Only then does the moment of opening arrive. A numerical model of the Matrix must therefore include parameters of closure, internal tension, packing density, number of concealed layers, degree of opening, sequence in which the layers emerge and formation of the active edge.

A model of folding and opening may be represented as a transition between two states. The first is a closed structure. It has a small external volume, a bounded contour, a high density of internal elements, a small visible area and little external differentiation. The second is an open structure. It possesses a larger visible area, a pronounced centre, a periphery, layers, petals, branches, edges, radiality or asymmetrical unfolding. Between them lies a transitional zone in which the form is partly open: the shell has already been disrupted, but the internal structure has not yet been manifested completely. This intermediate stage is the most important for understanding morphogenesis.

Numerically, such a transition may be described in several ways. The first is a geometric model of opening. The initial form is defined as a set of elements arranged around a centre and turned inwards. The petals of a bud, for example, may be represented as thin surfaces folded around a central axis. An opening parameter is then introduced that gradually alters the angle of each element relative to the centre. At a low parameter value, the petals remain closed. At an intermediate value, they are partly open. At a high value, they diverge outwards to form a flower or lotus structure. Such a model is simple, but already permits the transition from closed to open to be described numerically.

The second approach is a model of layers. The form is defined as a system of nested shells or contours. In the closed state, the external shell conceals those within it. As the form opens, the layers begin to separate, shift, unfold and become visible. This approach is well suited to modelling a bud, bulb, seed, geode, planetary shell, multilayered artefact, mandala or the Sri Yantra as a cultural scheme. Important parameters include the number and thickness of the layers, the order in which they open, the distance between them, their degree of symmetry and the character of each layer’s edge.

The third approach is a model of a folded surface. Here, the initial form is represented as a surface gathered into folds. Such a surface may be described by a mesh of points, triangles or curved elements. Rules of deformation are then applied to it: bending, stretching, separation, rotation, straightening, opening along an axis or unfolding from centre to periphery. This makes it possible to model the transition from a compressed folded structure to an unfolded surface. It is especially important for leaves, petals, soft tissues, folded geological strata and certain architectural analogies.

The fourth approach is an energy-based model. The form is treated as a system tending to minimise or redistribute elastic, surface or mechanical energy and internal stress. In the closed state, energy may be stored within folds, compression, bends or a shell. When conditions change, the system passes into a more open state. Such a model is more complex, but also closer to physical processes. The opening of a bud, for example, is associated with tissue growth, changes in turgor and the direction of cellular expansion; a geological fold, with pressure and plastic deformation; and a shell-like structure, with a balance of stresses. For the philosophy of the Matrix, the important point is that opening is not arbitrary: it may result from the redistribution of internal forces.

The fifth approach is a discrete-state model. In this model, a form passes through a finite set of stages: closed, stressed, fractured, partly open, open in multiple layers, stabilised, reproductive or returning to a new centre. Such a model does not necessarily describe an object's physics precisely, but it makes it possible to define a general morphogenetic sequence. It is particularly useful for connecting numerical modelling with A–B–C–D. Measurable parameters may be specified for every state: degree of closure, area of opening, number of visible layers, edge curvature, radiality, asymmetry, fractal dimension, degree of branching and peripheral activity.

The principal parameter of a model of folding and opening is the degree of opening. This may be represented as a value from 0 to 1, where 0 corresponds to a completely closed state and 1 to the maximally open state. In a biological form, this might represent the opening angle of the petals, the ratio between the visible area of a flower and the area of the closed bud, the distance between layers or the degree to which elements have emerged from the centre. In a geometric model, it may represent the angle through which elements rotate outwards. In a folded surface, it may indicate the degree to which folds have been straightened. In a cultural diagram, it may describe the transition from a central point to a multilayered structure. Such a parameter makes it possible to formalise one of the study's central ideas: a form may possess a measurable trajectory of opening.

The second parameter is closure. It indicates the degree to which the structure is closed in relation to its external environment. A closed form possesses a clearly defined shell, few open edges, a high degree of internal concealment and a compact contour. An open form possesses more external elements, an active edge, visible layers and a complex periphery. Closure may be assessed through the ratio of open edge to total boundary, the area of visible internal structure, compactness or the number of connections between the internal and external levels. Within the A–B–C–D model, closure is greatest at stage A and gradually decreases towards stage C, although a new closed form may arise at stage D—a fruit, seed or shell belonging to a new cycle.

The third parameter is internal tension. This is more difficult to measure directly, especially from images, but may be specified as a latent variable within the model. Tension reflects the readiness of a closed structure to open. In a bud, it may take the form of growth pressure; in a fold, elastic stress; in a geological stratum, tectonic stress; in a shell, a difference between forces; and in a cultural form, compositional compression. Morphologically, tension manifests itself through fracture lines, folds, symmetrical compression, elongated axes, taut edges and concealed layers. A numerical model may represent tension as a parameter affecting the rate of opening, the direction of deformation and the probability of rupture.

The fourth parameter is the number of layers. A closed form may contain a single layer, several nested layers or a complex multilayered structure. In a bud, these are rows of petals; in a bulb, scales; in a seed, protective and embryonic structures; in a geode, an external stone shell and

internal crystalline cavity; in a planetary structure, core, mantle, crust and atmosphere; and in sacred geometry, centre, triangles, lotus bands and external frame. A model of opening must make it possible to specify both the number of layers and the order in which they become manifested. This is especially important because the Matrix has frequently been described in this book not as a flat sign, but as a structure composed of levels.

The fifth parameter is the sequence of opening. A form may open through all its layers simultaneously or progressively. The outer petals, for example, may open before the inner ones; a crack may begin in one region and propagate; a fold may straighten from its edge towards the centre or from centre to edge; a shell may rupture along a single line; and a mandala-like structure may be read from centre to periphery or in the opposite direction. A numerical model must allow the direction of opening to be specified: centrifugal, centripetal, axial, radial, spiral, asymmetrical or frontal. This would make it possible to compare different morphological types.

The sixth parameter is edge activity. During opening, the edge becomes especially significant. In a closed form, the edge may be smooth and protective. During the process of opening, it becomes a zone of separation, bending, petal formation, cracking, waves and fractal complexity. In an open form, the edge may become the principal carrier of morphological expression. Numerically, edge activity may be described through curvature, length, irregularity, fractal dimension, number of projections and changes in contour over time. This connects models of folding and opening with the morphometry and fractal analysis discussed in the preceding chapter.

The seventh parameter is the symmetry of opening. Certain forms open almost symmetrically: a flower, lotus, mandala or radial rosette. Others open asymmetrically: a crack in stone, the opening of a damaged shell, a geological fault, the uneven growth of a leaf or the partial destruction of a form. The symmetry of opening may be described through the angular distribution of elements, uniformity of radii and degree of correspondence under reflection or rotation. The Matrix hypothesis must account for both possibilities. The Matrix should not be reduced solely to the perfectly symmetrical flower; it must also describe asymmetrical opening in which the invariant manifests itself through a disruption of equilibrium.

The eighth parameter is the relationship between centre and periphery. In a closed form, the centre is often concealed or inaccessible. In an open form, it becomes visible while the periphery expands around it. The reverse logic is also possible: the form opens from its edge and gradually reveals its interior. The model must therefore account for the location of the source of opening. If the source is at the centre, the process will be radial. If it is located at the edge, the process will be frontal or rupture-driven. If it follows an axis, it will be axial. If it occurs at several nodes, it will be multiple. This will make it possible to model not only the lotus or flower, but also a crack, fault, geode, shell, artefact or folded surface.

A model of folding and opening is especially natural for biological objects. The bud is a classic example of a closed structure in which the future floral form is already present but remains compact. During opening, the petals change their angle, spacing, curvature, visible area and edge activity. The flower gradually passes from a dense centre to a radial periphery. The lotus, discussed in Chapter 21, provides a particularly expressive example: an aquatic environment, axial ascent, bud, opening petals, central reproductive region and return to the seed stage. A numerical model may reproduce this process in simplified form.

The fold is also important to the leaf. A young leaf is often rolled, folded or curled. As it grows, it unfolds, increases its surface area, extends its venation and forms its edge. Here, opening is connected with surface growth. If different parts of the leaf grow at different rates, bends, waves,

folds, lobes and asymmetry emerge. Numerically, this may be modelled as a surface undergoing heterogeneous growth. If the central vein grows differently from the lateral regions, the form becomes elongated. If the edge grows faster than the interior, it may become undulating or folded. This demonstrates that folding and opening may result from differential growth.

For geological objects, the fold acquires a different meaning. There is no biological opening, but there is deformation of layers, pressure, bending, compression, faulting, thrusting and erosional exposure. A geological fold may be concealed within a massif and subsequently become visible in cross-section or at the surface. The book must not conflate geological and biological mechanisms, but they may be compared morphologically: both involve a layer, deformation, an internal structure and a transition from concealed to visible. A numerical model of folding may be based upon deformation mechanics, but for the purposes of this chapter it is sufficient to identify the general principle: changing pressure and resistance parameters produces bends and multilayered structures.

In artefacts and cultural forms, the fold possesses symbolic and compositional significance. An ornament may depict opening even if the object itself does not open physically. A mandala or the Sri Yantra may be read as an unfolded structure of centre, layers and boundaries. The lotus motif in architecture and iconography often represents the idea of an opened centre. The fan, scroll, folded fabric, petal ornament and ritual rosette are all cultural forms in which folding and opening may be interpreted morphologically. Here, a numerical model does not explain the origin of cultural meaning, but may demonstrate the geometric principle underlying the visual motif.

A model of the transition from a closed circle to a lotus rosette is especially promising. The initial form may be a simple circle. Small undulations then appear along its edge. At the next step, these undulations intensify and become petals. The petals then acquire layers, internal veins, asymmetry and curvature. The result is an open, multilayered form. Such a model connects several themes of the study simultaneously: the circle as a closed form, the edge as an active zone, the petal as an element of opening, the layer as a stage, the centre as an organising node, repetition as rhythm and fractal complexification as peripheral complexity. This type of model may become one of the numerical approximations of the Matrix of opening.

Another promising variant is a ‘seed—shell—crack—shoot’ model. The initial form is closed. Tension then grows within it. A weak region emerges within the shell. A crack or opening appears. An axial element—the shoot—emerges through it. It then begins to branch or form a new open structure. This model connects folding, opening, axis and branching particularly effectively. It may be used as an abstract model of the transition from A to B and C within the A–B–C–D system. Importantly, opening here does not take the form of a gentle petal-like unfolding; it may be rupturing, tension-filled and asymmetrical.

A ‘bud—flower—fruit’ model may also be proposed. In this model, the closed bud contains several nested layers of petals. The opening parameter gradually increases the angle of the petals. The form then reaches its maximum degree of openness. After this, some elements change state and a central fruiting or seed-bearing region appears. Such a model includes not only opening, but also a return to a new potentiality. It is especially important for the A–B–C–D model because it demonstrates that opening is not the final point. After C comes D—a new form of compression, seed, fruit or centre of the next cycle.

A model of folding and opening must account for time. A form does not simply change a parameter instantaneously. It passes through a sequence of states. The rate of opening, delays between layers, irregularity of movement, acceleration, deceleration and phase transitions may

all be specified. The initial changes may be almost imperceptible, after which opening accelerates and then stabilises. In biology, this may correspond to actual growth; in a geometric model, to a gradual change of angle; and in a cultural interpretation, to a sequence in which the form is read. In every case, a temporal parameter makes the model morphogenetic rather than merely geometric.

A model of folding and opening may also be connected with the visualisation of energy or stress. At an early stage, high tension may be represented within the closed form. The tension then becomes redistributed towards the edge. The edge subsequently opens, and the tension diminishes or is transformed into a new structure. This may be represented numerically through fields of values: density, pressure, curvature, strain and bending energy. Such visualisation is especially useful for explaining why a form opens along particular lines rather than arbitrarily. Fold lines, cracks, veins, petal boundaries or axes may be interpreted as paths through which tension is redistributed.

This is highly significant to the Unified Matrix hypothesis because it makes it possible to connect form and force. The earlier chapters compared forms primarily in visual and morphological terms. Real form, however, is always connected with forces: growth, pressure, flow, diffusion, elasticity, gravity and environment. A model of folding and opening demonstrates that a morphological invariant may be connected with the dynamics of stress. A closed form retains its internal structure. An open form releases it. The edge records the transition. A layer preserves the memory of previous states. An axis directs the unfolding. The philosophical language of the Matrix thus acquires a computational and physical approximation.

Such a model must nevertheless remain open and modular. It is impossible to create a single universal model of folding that describes a bud, leaf, geological stratum, geode, planetary shell, artefact and mandala with equal precision. These objects involve different mechanisms. It is therefore more accurate to speak of a family of models of folding and opening. Some will be geometric, others mechanical, others growth-based and still others symbolic-geometric. They are united not by cause, but by a morphogenetic scheme: closure, internal structure, tension, transition, opening, active edge and new organisation.

Practical numerical research may begin with simple models. A circular form containing several nested petal-like elements could, for example, be assigned an opening parameter. At every step, its area, perimeter, edge curvature, degree of radiality, number of visible layers and asymmetry could be measured. Random deviations, uneven opening, differing petal lengths and fractal complexification of the edge could then be introduced. The modelled states could subsequently be compared with images of actual buds, flowers, lotuses, ornaments, mandalas and crop circles. This would establish the first bridge between numerical modelling and the image database.

Another simple protocol could focus upon a shell. The initial form would be a closed ellipse or sphere. A field of stress would be defined within it. A weak zone would emerge upon the shell. Once a threshold was exceeded, opening would occur in the form of a crack, aperture or separation of the edges. An axis or branching structure would then emerge from the internal region. Such a model could be useful in the analysis of a seed, egg, geode, crack in stone, planetary shell and the cultural image of ‘opened grain’. It would connect models of opening with L-systems, since the opening of the shell could initiate a growth algorithm.

A third protocol could model a multilayered mandala-like form. An initial point would be surrounded by several potential layers. A new layer would open at every step: first the central

region, then a triangular or radial structure, followed by a petal band and finally an external boundary. Such a model would not claim to provide a physical description of the Sri Yantra or a mandala, but could be used as a numerical scheme for the sequential manifestation of levels. It would be especially useful for the cultural-geometric section of the Matrix, in which the order of visual unfolding matters more than the physics of opening.

A model of folding and opening should also include the possibility of reverse movement. In both nature and culture, form not only opens, but closes again. A flower closes, a fruit forms a new shell, a seed returns the form to a state of potentiality, a scroll is rolled up and a cycle concludes. A numerical model should therefore permit not only movement from A to C, but also the transition from C to D and to a new A. Opening without a return to potentiality would constitute an incomplete scheme. The Matrix presupposes a cycle: closed—opening—open—reproducing a new closed form.

In this sense, the model of folding and opening directly anticipates Section 23.5, in which the A–B–C–D model will be proposed in numerical form. It is already possible to identify the necessary parameters: closure, degree of opening, number of layers, degree of branching, fractal dimension, edge asymmetry, peripheral activity, the relationship between centre and external boundary, internal tension and rate of transition. These parameters will make it possible to describe each stage not only verbally, but numerically. A–B–C–D will then become not only a philosophical scheme, but also a morphological trajectory through parametric space.

The illustration accompanying this section should depict a model of folding and opening (*Fig. 4*). It may be structured as a sequence of four or five states: a closed form, a stressed shell, partial opening, multilayered opening and a new seed-like or central structure. The centre, layers, opening petals or shells, active edge, direction of opening and change in area should be shown. Its principal purpose is to demonstrate the transition itself: form does not merely exist, but unfolds from a concealed structure into an external multilayered organisation.

Such an illustration would be important because it would connect the computational models with the figurative core of the study. The reaction–diffusion model would demonstrate field patterns; the L-system, growth and branching; fractal iteration, self-similar complexification; and the model of folding and opening, the transition from closed to manifested. Together, they establish the foundation for a numerical understanding of the Matrix as a system of generative processes rather than a collection of static analogies.

Thus, models of folding and opening are necessary for the numerical description of the transition from a closed potential structure to an open multilayered form. They make it possible to formalise parameters such as closure, degree of opening, number of layers, internal tension, edge activity, symmetry, asymmetry, direction of opening and the relationship between centre and periphery. Their significance to the Unified Matrix hypothesis lies in translating the study's central images—grain, bud, lotus, flower, shell, artefact and mandala—into the language of computable states and transitions. They do not prove the Matrix, but demonstrate how its central idea of opening may become an object of numerical modelling.

23.5. The A–B–C–D Model in Numerical Form

Following the discussion of reaction–diffusion models, L-systems, fractal iterations and models of folding and opening, it is necessary to address the central question of this chapter: can the A–B–C–D model be represented numerically? Until now, A–B–C–D has primarily been used as a morphological and philosophical scheme. Stage A designated a closed, potential, compressed or seed-like state. Stage B represented transition, the beginning of opening, disruption of closure, the appearance of an axis, crack, shoot, direction or initial differentiation. Stage C represented an open, complex, multilayered, radial, branching or manifested form. Stage D denoted the completion of the cycle, a fruit, seed, new potentiality or transition to the next level. For scientific testing and numerical modelling, however, such a descriptive scheme is insufficient. It is necessary to define parameters through which every stage can be measured, compared and modelled.

A numerical representation of A–B–C–D does not mean that all natural, cultural and cosmic forms must literally pass through the same sequence. Such an assumption would be methodologically incorrect. Seeds, buds, leaves, trees, geological folds, nebulae, artefacts and sacred diagrams have different mechanisms of origin. They may nevertheless be described through a common set of morphological variables: closure, degree of opening, number of layers, degree of branching, fractal dimension, edge asymmetry, centredness, peripheral activity, the relationship between interior and exterior, and degree of differentiation. These parameters make it possible to transform A–B–C–D from a figurative formula into a working model of a morphological trajectory.

The first parameter is closure. This indicates the extent to which a form is separated from its external environment and its internal structure remains concealed. At stage A, closure is at its maximum. A seed possesses a shell; a bud holds its petals within; a geode conceals a crystalline cavity; a stone may contain internal stresses; and a cultural sign may still be reduced to a simple circle or point. Numerically, closure may be expressed through the compactness of the form, its area-to-perimeter ratio, the proportion of its contour that remains closed, the small number of open edges and the low visibility of internal elements. The more concentrated and bounded the form, the higher its degree of closure.

At stage B, closure begins to decrease. A crack, rupture, shoot or primary axis appears; the petals begin to open; the shell deforms; branching begins; or an internal structure emerges. Numerically, this may be manifested through an increase in the length of the open edge, an expansion of the visible internal area, decreasing compactness, the appearance of new contour segments and the emergence of axial directionality. Stage B is especially important because it is here that form ceases to be merely a closed potentiality, although it has not yet become a completed open structure.

At stage C, closure is minimal or has been substantially transformed. The form is open: the petals have separated, the branches have spread, the layers have become visible, the edge has become more complex, and centre and periphery have begun to function as an integrated system. This does not always mean complete openness, however. Some stage-C forms preserve both central organisation and an external boundary. A flower is open, but its petals still form a coherent structure. A mandala is unfolded in layers, but remains bounded by an external circle or square. A nebula may possess an open filamentary structure while retaining a shell. The numerical model must therefore distinguish between a simple loss of closure and a transition to organised openness.

At stage D, a new form of closure emerges. A fruit, seed, new node, new centre, secondary circle, daughter structure or new potential point completes one cycle while simultaneously opening the next. The degree of closure may therefore increase again at stage D, but at another level. This is fundamental: A and D do not coincide completely. A represents the initial potentiality of the current cycle. D is the result of opening and contains the possibility of a new A. Numerically, this may be described through the appearance of secondary centres, new compact elements, seed-like structures, recurring modules or localised regions of high density within the open form.

The second parameter is the degree of opening. This is one of the most evident indicators within the model. It may be represented as a value from 0 to 1, where 0 corresponds to a completely closed state and 1 to a maximally open form. For a bud, this might be the average opening angle of the petals or the ratio between the visible area of the flower and the area of the closed bud. For a leaf, it may represent the degree to which the blade has unfolded. For a shell, it may indicate the size of an aperture or crack. For a geometric scheme, it may correspond to the number of manifested layers extending from centre to periphery. For an artefact, it may describe the transition from a simple sign to a complex composition. The degree of opening makes the A–B–C transition measurable rather than merely figurative.

At stage A, the degree of opening is close to zero. Internal elements remain concealed, layers are not manifested and the periphery has not been activated. At stage B, its value begins to increase as the first signs of external emergence appear. At stage C, it reaches its maximum: the structure is open, the layers are visible and the edge is active. At stage D, the degree of opening may remain high if the form preserves its openness, or decrease if the final stage involves the formation of a new seed or fruit. The dynamics of opening therefore need not follow a simple linear path. The degree of opening may increase, reach a maximum, stabilise and then partially return to the closed state of a new cycle.

The third parameter is the number of layers. Layering is one of the principal characteristics of the Matrix. Within a closed form, layers may be concealed or superimposed. Within an open form, they become distinguishable. It is possible to count nested shells, rows of petals, concentric zones, geological strata, levels of a mandala, rings, contours, bands or filamentary shells. At stage A, the number of visible layers may be minimal, although concealed layering already exists. At stage B, the first distinguishable levels appear. At stage C, layering reaches its maximum and becomes visually pronounced. At stage D, a new compact layer associated with a fruit, seed or new centre may emerge.

The fourth parameter is the degree of branching. This is especially important for leaves, trees, roots, river networks, cracks, vascular structures, cosmic filaments and L-systems. Branching may be measured through the number of branch orders, number of nodes, average node degree, segment lengths, branching angles, network density and the relationship between the principal axis and lateral branches. At stage A, branching is absent or remains potential. At stage B, the first axis or lateral directions appear. At stage C, the structure develops into a complex network. At stage D, new terminal nodes, seeds, leaves, fruits or secondary centres may emerge and initiate a new branching cycle.

The fifth parameter is fractal dimension. This makes it possible to describe the scale-dependent complexity of a contour or network. Within the A–B–C–D model, fractal dimension may change as the form opens. The smooth, closed form of stage A generally possesses low edge complexity. At stage B, cracks, bends, initial projections or waves appear. At stage C, the edge becomes more complex and the network more extensively branched. Fractal dimension may therefore increase.

At stage D, two alternatives are possible: complexity may be preserved at the periphery, or parts of the structure may be gathered once again into more compact elements of a new cycle. Fractal dimension is therefore an important indicator of the transition from a simple contour to a complex active edge.

The sixth parameter is edge asymmetry. A perfectly symmetrical model is useful for explaining a fundamental principle, but real forms are frequently asymmetrical. Edge asymmetry may be measured through deviation from reflective or radial symmetry, variation in radii, irregularity among petals, differences between sectors, the distribution of curvature and the unevenness of projections and indentations. At stage A, the form may be almost symmetrical if it is compact and shell-like. At stage B, asymmetry often increases because opening begins within a particular region: a crack, shoot, initial rupture or local deformation. At stage C, asymmetry may either decrease as the structure stabilises or increase under the influence of a complex edge and its environment. At stage D, it may be transferred to the individual characteristics of the new potential form.

The seventh parameter is centredness. For many objects examined in this study, the centre has been a key invariant. Centredness must, however, be described numerically. It is possible to measure the position of the geometric centre, centre of mass, centre of symmetry, point of maximum density, initial growth node or compositional centre. It is also possible to assess the extent to which the elements of a form are distributed around that centre. At stage A, the centre frequently coincides with a compact potentiality: a seed, point, nucleus or closed bud. At stage B, the centre begins to generate an axis or direction. At stage C, it becomes the visible organiser of the open structure. At stage D, secondary centres emerge, which is especially important to the cyclic nature of the Matrix.

The eighth parameter is the relationship between centre and periphery. This may be measured through radial profiles, distributions of element density, distance from centre to edge, the degree to which structure changes from the internal zone to the external one, the number of peripheral elements and edge activity. At stage A, the periphery is weakly expressed because the structure is compact. At stage B, the periphery begins to become active. At stage C, centre and periphery form an unfolded system of petals, branches, layers, shells, filaments and edges. At stage D, the periphery may generate new centres or return the structure to a seed-like form. The model must therefore account not only for the centre itself, but also for the manner in which it organises the periphery.

The ninth parameter is the degree of differentiation. This indicates the extent to which the form is divided into distinct elements: centre, axis, layers, branches, petals, edges, nodes and peripheral components. At stage A, differentiation is minimal or concealed. At stage B, the parts begin to become distinct. At stage C, differentiation reaches its maximum: the structure is complex and its elements possess different functions and positions. At stage D, part of the differentiated structure may once again become concentrated into a compact form. Numerically, differentiation may be described through the number of identifiable components, the diversity of element types, the number of levels, the entropy of the feature distribution and the number of segments and nodes.

The tenth parameter is edge activity. This is associated with curvature, length, irregularity, fractality, the number of projections and the rate at which the contour changes over time. Within the A–B–C–D model, the edge at stage A is generally protective and closed. At stage B, it becomes a zone of disruption and transition. At stage C, the edge reaches its greatest expressiveness

through petals, branches, waves, cracks, filaments and shells. At stage D, it may either stabilise or begin to form a new shell. Edge activity is one of the most useful parameters for distinguishing between closed and open forms.

The eleventh parameter is the temporal rate of transition. Not all forms pass through the stages at the same speed. Some open gradually, while others do so abruptly. Some remain closed for a long period before rapidly entering the opening phase. Others become progressively more complex through numerous small steps. Numerically, this may be described through the rate of change in the degree of opening, perimeter growth, increase in the number of layers, emergence of branches or change in fractal dimension. Temporal dynamics is especially important to numerical modelling because it describes not merely the state of a form, but also the trajectory of its transformation.

The A–B–C–D model may therefore be represented as the movement of a point through a multidimensional morphological space. Each axis of this space corresponds to one parameter: closure, opening, layers, branching, fractality, asymmetry, centredness, edge activity and differentiation. Stage A occupies a region of high closure, low opening, low visible differentiation and low edge activity, but high potential centredness. Stage B occupies a transitional region: closure decreases, opening increases, and the axis, edge, first layers and asymmetry emerge. Stage C is characterised by a high degree of opening and differentiation, a pronounced periphery, layers, branching and an active edge. Stage D combines the completion of opening with the emergence of a new compact potentiality.

Such a representation is especially important because it frees the A–B–C–D model from an excessively literal interpretation. A, B, C and D need not be four rigid images. They may be regions within a parametric space. One object may pass through them rapidly and another slowly. One may possess strong radiality, while another exhibits extensive branching. One may return to a new seed, while another returns to a new network centre. The general scheme is preserved not as a fixed pattern, but as a trajectory of change: from compression to differentiation, from concealed to manifested, from centre to periphery and from opening to new potentiality.

A provisional table of parameters may be proposed for the numerical model. At stage A, closure is high, the degree of opening is low, the number of visible layers is low or the layers remain concealed, branching is absent or potential, the fractal dimension of the edge is low, asymmetry is limited or concealed, centredness is high and edge activity is low. At stage B, closure is moderate and decreasing, opening increases, the first layers appear, branching begins, the fractal complexity of the edge increases, asymmetry often grows and the centre begins to produce an axis or direction. At stage C, opening is high, layers are pronounced, branching is developed, the edge is active, fractal dimension may be high, and centre and periphery exist in a complex relationship. At stage D, new compact elements, secondary centres, seed zones, fruits, new nodes or recurring modules capable of becoming a new A emerge.

Different types of A–B–C–D must be distinguished according to morphological family. For the floral-lotus type, A is the bud or seed potentiality, B is partial opening, C is the open flower and D is the fruit or seed. For the tree-like type, A is the initial axis or shoot, B the first branches, C the developed crown or network, and D the leaves, fruits, seeds or new points of growth. For the shell type, A is the closed shell, B a crack or opening, C the manifestation of the internal structure, and D a new shell-like or crystalline organisation. For the geometric type, A is a point or circle, B the first lines and directions, C a multilayered mandala or yantra, and D the external boundary and

return to the centre. For the network type, A is the initial node, B the first connections, C the developed network and D new source nodes.

This approach prevents oversimplification. The A–B–C–D model should not force every object into the biological cycle of a plant. It should provide a common language of stages that is realised differently in different families of form. This constitutes its scientific and philosophical value. It does not claim that ‘all forms are flowers’. It proposes that ‘many forms may be described as a transition from potential compression to open organisation and then to a new potentiality’. This formulation is considerably more cautious and substantially stronger.

Several types of transition functions may be proposed for numerical modelling. A linear function means that a parameter changes uniformly; the degree of opening, for example, increases by the same amount at every step. A nonlinear function permits more realistic processes to be modelled: a prolonged concealed state, followed by rapid opening and subsequent stabilisation. A sigmoid function may describe growth that is initially slow, then rapid and finally slows again. A threshold function may describe a crack or rupture: the form remains closed below a particular stress level and rapidly passes into a new configuration once that threshold is exceeded. Different functions are appropriate for different objects.

An environmental parameter is an important component of the model. Form does not develop in a vacuum. The environment may accelerate or slow opening, increase asymmetry, restrict branching, alter the edge and affect both centre and periphery. In biology, environmental factors include light, water, temperature, nutrition and pressure from neighbouring tissues. In geology, they include pressure, material resistance, moisture, erosion and temperature. In cosmic objects, they include gravity, medium density, radiation and magnetic fields. In cultural forms, they include canon, technique, material and compositional intention. The numerical model of the Matrix should therefore incorporate parameters of external constraint, even if these are initially represented in abstract form.

Another important parameter is noise or variability. If a form is modelled too perfectly, it will resemble a rigid geometric scheme. Real forms almost always contain deviations. Small amounts of noise may be introduced into angles, lengths, the rate of opening, the shape of the edge, the position of nodes and the thickness of layers. This makes it possible to model individuality. Noise must not, however, destroy the invariant completely. The important task is to identify the range within which the structure remains recognisable without becoming mechanically perfect. In this way, the numerical model will correspond more closely to real objects.

To test the A–B–C–D model, its parameters must be compared with empirical data. In a series of photographs depicting a flower as it opens, for example, the degree of opening, area, petal angle, edge curvature and number of visible layers may be measured at different stages. For leaf growth, changes in area, venation and contour may be measured. For a crack, the increasing length of the open edge and the development of branching may be recorded. For a mandala or yantra, the sequence of visual reading from centre to periphery may be examined. The same parameters may be measured at every computational step within an artificially generated model. The trajectories can then be compared. If different objects display similar types of trajectory, the hypothesis will receive more rigorous support.

It is especially important to compare transitions, not merely final states. Two forms may appear similar when complete, yet have followed different trajectories. Conversely, two forms may have different final appearances while displaying similar dynamics in their changing parameters: decreasing closure, increasing openness, increasing edge complexity and the emergence of

layers. The numerical A–B–C–D model must therefore be dynamic. It must describe not only ‘what resulted’, but also ‘how the form passed from one state to another’. This corresponds to the general logic of the study: the Matrix is not only form, but morphogenesis.

The A–B–C–D model may be represented as an algorithm. Its inputs consist of initial parameters: centre, shell, degree of closure, concealed layers, possible directions of opening, noise level and environmental constraints. At every step, changes are calculated: closure decreases, opening increases, layers appear, the edge expands, branching begins and fractal complexity changes. Once particular thresholds are reached, the form passes from A to B, from B to C and from C to D. At stage D, new centres or compact elements are created and may be transferred into the next cycle. Such an algorithm may be implemented in geometric, growth-based, fractal, reaction–diffusion or hybrid versions.

Hybrid models are especially promising. An initial shell, for example, may open according to a folding model; an L-system of branching may then begin from the revealed centre; the edge may become more complex through fractal iteration; and a reaction–diffusion model may establish the distribution of spots or stripes across the surface. Such a hybrid is considerably closer to the actual complexity of forms. In nature, different mechanisms rarely operate in isolation. Growth, diffusion, mechanics, branching, folding, edges and environmental influences interact. A future numerical Matrix must be capable of combining several generative mechanisms within a unified dynamic scheme.

At the first stage, however, a simple parametric model will be sufficient. Its purpose is not to reproduce nature in its entirety, but to demonstrate the principle. One might begin with a circle containing several concealed petal-like layers. At each step, the degree of opening increases, closure decreases, visible layers appear, the edge becomes more complex and secondary centres ultimately form. Such a model may be compared visually with a bud, lotus, mandala, crop circle or cultural rosette. Branching and asymmetry could subsequently be introduced. In this way, a numerical language of the Matrix would gradually be constructed.

Stage D plays a special role within this model. Simplified schemes often imply that C is the end: the flower has opened, the tree has grown or the mandala has been completed. Within the Matrix, however, C is not the final point. The completion of opening must lead to a new potentiality. In biology, this takes the form of fruit and seed. In a tree, it is manifested through seeds and new shoots. In a network, it appears as new nodes. In a cultural form, it is expressed through the possibility of repeating the motif. In a numerical model, D must be represented through the formation of new centres, new compact elements or new initial conditions. Without D, the model would be linear rather than cyclical.

Numerically, D may be described through several indicators: the number of secondary centres, their degree of compactness, the probability of initiating a new cycle, their connection with the original centre, the distribution of new nodes along the periphery and the degree to which new elements separate from the parent structure. In a flower, this may be a seed-bearing region; in a fractal tree, the terminal points of branches; in a network, highly connected nodes; in a mandala, the return of the gaze to the centre or completion by means of an external frame; and in a field diagram, peripheral circles that may become new centres. D thus becomes a measurable stage rather than merely a philosophical ‘return’.

Edge asymmetry is also especially important at stage D. New potentiality frequently arises not uniformly, but at particular locations: seeds are distributed within a fruiting structure, lateral buds emerge at nodes, cracks generate new directions and peripheral circles appear in particular

regions. D may therefore be associated with the localisation of future growth. The numerical model must recognise that a new cycle may begin not from the geometric centre of the previous form, but from a peripheral node, edge, crack, fruit or lateral branch. This makes the model more realistic and conceptually profound.

To visualise the A–B–C–D model, it is possible to construct a diagram of parameters over time. The horizontal axis would represent stages A, B, C and D. The vertical axes would represent closure, opening, number of layers, branching, fractal dimension and edge asymmetry. Closure, for example, decreases from A to C and partially increases at D. Opening increases from A to C. Layers become visible at B and C. Branching increases at C. The fractal dimension of the edge increases from A to C. Asymmetry may increase at B and stabilise at C. Such a diagram would enable the reader to see that the model concerns a parametric trajectory rather than merely a sequence of images.

The illustration accompanying this section should present the A–B–C–D model in numerical form (*Fig. 5*). It might combine four stages of form with graphs of the parameters. The upper part could show four schematic states: closed form A, initial opening B, open multilayered structure C and new seed-like potentiality D. The lower part could show several curves: closure, opening, layers, branching, fractal complexity and edge asymmetry. Such an illustration is especially important because it would explain visually the transition from a philosophical scheme to a numerical model. It would demonstrate that every stage can be described through a set of measurable variables.

It is important that the illustration should not appear to present a completed mathematical theory. It should be presented as a conceptual numerical model. The proposed parameters are intended for further investigation and are not declared exhaustive. In future, they may be refined, supplemented, removed where weak or adapted to particular types of object. Even at this stage, however, they provide a foundation for computational thinking: the Matrix may be represented as the dynamics of formal parameters.

Overall, the numerical A–B–C–D model performs several functions. First, it disciplines the figurative language of the study. Second, it connects the philosophical hypothesis with morphometry and fractal analysis. Third, it makes it possible to model transitions rather than merely completed forms. Fourth, it opens the way to comparisons among natural, cultural and computational objects. Fifth, it demonstrates that the Matrix may be understood as a parametric space of morphogenesis within which different forms follow different trajectories.

The conclusion may be formulated as follows. Numerical modelling of the Matrix should not begin by claiming to provide a universal explanation of every form in the universe. It should begin by constructing a limited set of generative models: reaction–diffusion patterns, L-systems of growth, fractal iterations, models of folding and opening, and the parametric A–B–C–D scheme. Each describes a distinct type of morphogenetic process. Together, they may establish the foundation of a computational morphology of the Unified Matrix. Their purpose is not to prove the hypothesis once and for all, but to make it testable, modellable, comparable and open to further scientific refinement.

Thus, the numerical A–B–C–D model constitutes the concluding link of this chapter. It translates the key images—grain, bud, opening, flower, tree, lotus, shell, edge and new cycle—into the language of parameters: closure, opening, layers, branching, fractal dimension, edge asymmetry, centredness, peripheral activity and the emergence of new centres. It is through such parameters that the Unified Matrix of the Universe hypothesis may be connected with computational

experiment. This is its future prospect: from the contemplation of form to the modelling of form; from analogy to parameter; and from philosophical intuition to a testable morphogenetic programme.

Fig. 1. Reaction–Diffusion Models: Spots, Stripes, Spirals, and Radial Patterns as Results of Self-Organisation in a Distributed Medium

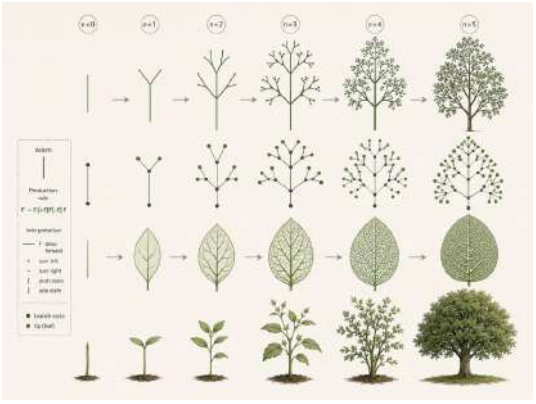

Fig. 2. L-Systems and Growth Algorithms: from a Simple Axiom to Branching, Leaf Venation, a Fractal Plant, and a Tree-Like Structure through the Repetition of Growth Rules

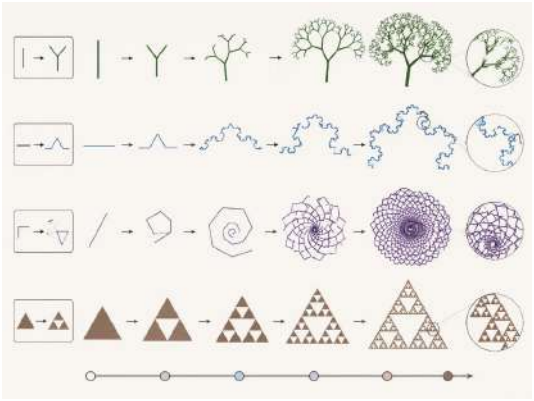

Fig. 3. Fractal Iterations: a Simple Initial Rule Repeated across Different Scales Generates Self-Similar Structures, Complex Edges, Branching, Spirality, and Nested Levels

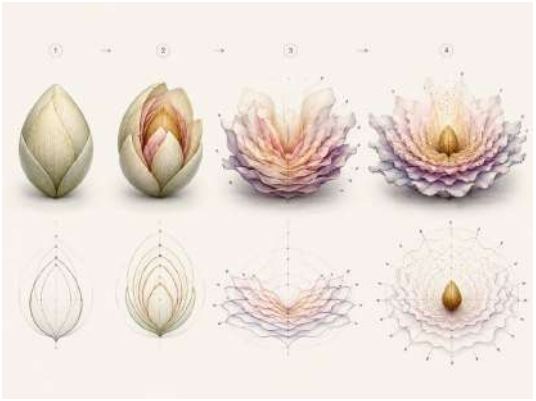

Fig. 4. Model of Folding and Unfolding: Transition from a Closed Structure to Partial Unfolding, a Multilayered Form, an Active Margin, and New Seed Potentiality

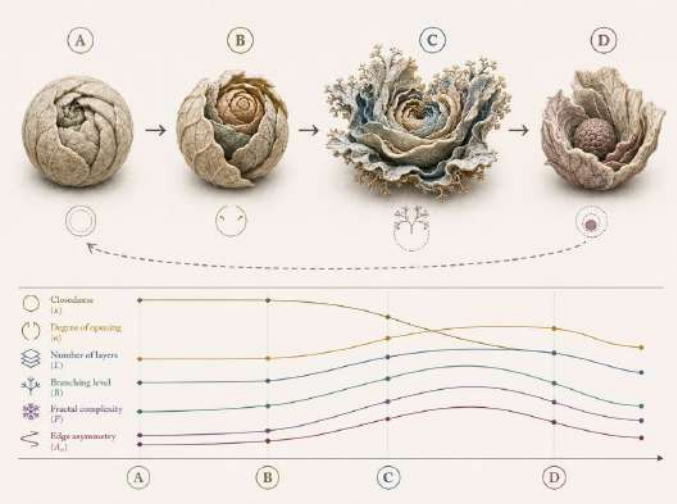

Fig. 5. The A–B–C–D Model in Numerical Form: Closure, Degree of Unfolding, Number of Layers, Level of Branching, Fractal Dimension, and Edge Asymmetry as Parameters of the Morphogenetic Cycle

Chapter Twenty-Four

Experimental Directions

24.1. Chemical Reaction–Diffusion Systems

Following the discussion of numerical modelling, it is necessary to turn to experimental directions capable of providing the Unified Matrix of the Universe hypothesis with a more rigorous research foundation. Whereas Chapter 23 demonstrated how spots, stripes, spirals, branching structures, folds, opening forms and fractal structures can be generated within a computational environment, the present chapter must pose the next question: which of these processes can be observed, reproduced and measured within real systems? Chemical reaction–diffusion media occupy an especially important place here because they make it possible to study the emergence of spatial patterns not merely as a mathematical possibility, but as a phenomenon observable in the laboratory.

Chemical reaction–diffusion systems are particularly valuable to this study because they reveal the transition from an almost homogeneous medium to a visible structure. In its initial state, the medium may be relatively uniform: a solution, gel, thin layer of reagents or chemical mixture. Through the interaction of substances and their propagation through space, spots, stripes, rings, waves, fronts, spirals, coloured zones, boundaries and complex spatial patterns subsequently emerge. What matters most is not the decorative beauty of such patterns, but the underlying fact that form may arise through the dynamics of interacting processes rather than from a predetermined external contour.

Within the context of the Unified Matrix hypothesis, chemical reaction–diffusion systems should be regarded as experimental models of the self-organisation of form. They do not prove the universality of the Matrix in a philosophical sense and do not explain every form in nature. They do, however, make it possible to test one of its central principles: simple local interactions distributed through space can create stable morphological structures. If such structures can be produced under laboratory conditions, altered through changes in their parameters, measured morphometrically and compared with computational models, the hypothesis acquires an important experimental dimension.

The central idea of a reaction–diffusion experiment is that two groups of processes occur simultaneously within the medium:

- The first group consists of reaction processes: substances interact, activate or inhibit one another, and change their concentration, colour, state, phase or local activity.
- The second group consists of diffusion processes: substances spread through space at different rates.

It is the differences between rates, local reactions and spatial propagation that create the conditions for heterogeneity. Where one component is amplified locally while another suppresses it or spreads across a wider area, a stable pattern may emerge.

This has direct significance for the morphology of the Matrix. Such systems make it possible to study experimentally the emergence of a centre, spot, front, edge, ring, layer, stripe or spiral. A spot, for example, may be regarded as a localised region of activity; a stripe, as an elongated boundary or stable zone of difference; a ring, as the radial propagation of a front; a spiral, as a dynamic wave combining rotation and propagation; and an active edge, as an area containing a steep concentration gradient or change of state. A laboratory chemical system may thus become a model environment in which fundamental morphological invariants can be observed under controlled conditions.

Chemical systems capable of producing waves and spirals are especially important. In such experiments, it is possible to observe how a reaction front propagates, reflects, curls, interacts with boundaries, collides with other fronts and forms stable rotating structures. Morphologically, this corresponds closely to themes that have appeared repeatedly throughout the book: the spiral, active edge, centre of rotation, wave propagation, field and boundary. These themes now acquire an experimental dimension. The spiral is no longer a symbol or cultural metaphor, but a dynamic regime within a chemical medium.

Striped and spotted patterns constitute another important type. They make it possible to test the Turing logic of pattern formation: under particular conditions, a homogeneous state becomes unstable and the medium spontaneously separates into regions of different concentrations. Such patterns may be compared with biological coloration, tissue structures, surface patterns, cultural ornaments and numerical models. This does not, of course, mean that every spot or stripe in nature has the same chemical origin. A laboratory system nevertheless demonstrates the underlying principle: spotted and striped patterns may emerge through the internal rules of a medium.

Ring-shaped and concentric structures are also important. In certain chemical systems, successive zones of precipitation, coloration or front propagation may be observed. Such rings recall layering, shell-like organisation, radial propagation, waves upon water, annual rings, concentric mandalas, crop circles or planetary structures. Once again, the mechanisms differ, but laboratory experimentation makes it possible to investigate a common morphological operation: the medium produces recurring layers. By changing the experimental parameters, it is possible to examine changes in the spacing, thickness, regularity, diffuseness, stability and edges of the rings.

To construct an experimental programme, it is necessary to determine which parameters will be controlled. Within a chemical reaction–diffusion system, these may include reagent concentrations, reaction rate, diffusion coefficients, temperature, medium viscosity, layer thickness, gel composition, the presence of boundaries, vessel shape, initial perturbations, reagent sources, illumination and observation time. Each parameter may affect the resulting form. An experiment should therefore not consist of a single visually striking observation, but of a series of trials in which parameters are varied systematically.

The shape of the domain in which the reaction takes place is especially important. The preceding chapter already noted that the boundary of a medium affects its pattern. This may be tested directly in the laboratory. The same chemical system may behave differently within a circular dish, rectangular cell, narrow channel, annular domain, droplet, thin layer, gel containing obstacles or heterogeneous surface. This relates directly to the concept of the active boundary. The boundary does not merely constrain the system; it participates in the formation of the pattern.

It is therefore possible to investigate experimentally how the domain edge affects spots, stripes, waves, spirals and concentric structures.

Initial conditions are also highly significant. If the medium is almost homogeneous, a pattern may emerge from minor random fluctuations. If a local source is introduced, the pattern may develop outwards from a centre. If several initial points are specified, interacting fronts may arise. If a concentration gradient is present, the structure may become directional and asymmetrical. This is especially important to the A–B–C–D model. Stage A may be represented as an almost homogeneous or potential state; stage B, as the emergence of a local perturbation or front; stage C, as an unfolded pattern; and stage D, as stabilisation, disintegration, the formation of new centres or transition to the next cycle.

Chemical reaction–diffusion systems may be integrated with morphometry. The resulting patterns should not merely be photographed, but also measured. For spotted structures, it is possible to count the number of spots and measure their average size, spacing, degree of regularity and spatial distribution. For stripes, one may measure width, length, curvature, branching and labyrinthine complexity. For rings, the number of layers, spacing, thickness and radial symmetry may be measured. For spirals, measurements may include the number of arms, spiral pitch, rotational velocity, stability of the centre and propagation radius. For active edges, curvature, fractal dimension and gradient sharpness may be assessed. Experimental data can then be compared with numerical models and natural images.

It is especially important to measure temporal dynamics. A completed chemical pattern represents only the final frame of a process. For the Matrix hypothesis, however, it is morphogenesis—the becoming of form—that matters most. Experiments should therefore be recorded as series of images: initial state, appearance of the first irregularities, growth of spots or stripes, interaction between fronts, stabilisation, disappearance or transition to a new regime. Such a time series would make it possible to construct graphs showing changes in parameters: the increasing number of spots, changes in edge length, expansion of the active region, front velocity and changes in fractal complexity. This is particularly important for comparisons with the A–B–C–D model.

Several experimental directions may be proposed:

1. Producing spotted and striped patterns within thin chemical layers or gels. The principal task would be to vary concentrations and diffusion in order to observe transitions between regimes: spots, short stripes, labyrinthine structures and mixed patterns.
2. Studying concentric rings and propagating fronts. Radial sources, local perturbations and domain geometry would be especially important here.
3. Modelling spiral waves within excitable chemical media. The key parameters would include front velocity, spiral stability and interaction with boundaries.
4. Comparing laboratory patterns with numerically generated reaction–diffusion models.
5. Conducting morphometric comparisons of laboratory patterns with natural and cultural forms.

The final direction requires particular caution. If a chemical pattern resembles biological coloration, an ornament or a nebula, this does not imply direct causal identity. Formal parameters may nevertheless be compared. Laboratory and biological spots, for example, may be compared through their distributions of sizes and distances; labyrinthine stripes through their curvature and width; spiral waves through their pitch, centre and radial propagation; and

concentric rings through their number of layers and regularity. Such comparisons are valid when conducted at the level of morphological features rather than as claims of identical origin.

Chemical experiments may also help to refine the concept of a stable morphological regime. If a system repeatedly enters a spotted, striped or spiral regime under different initial conditions, that regime is stable within the given range of parameters. This is important to the Matrix hypothesis. The recurrence of certain forms in nature may be connected not with their being ‘copied’ from a single template, but with their constituting stable solutions within different dynamic systems. The Matrix may then be understood as a space of stable morphogenetic regimes.

Experimental chemical systems also make it possible to investigate transitions between regimes. As concentration changes, for example, spots may elongate into stripes. Stripes may develop into labyrinths. Waves may become spirals. Rings may disintegrate or interact. Such transitions are extremely important because they demonstrate that morphological types are not always separated by rigid boundaries. They may represent phases of a single process. This is especially valuable to the present study: the Matrix may describe not only a set of forms, but also transitions between them.

Digital image processing is also essential to the experimental programme. A laboratory pattern should be photographed or recorded at a sufficient resolution and then processed through region extraction, binarisation, contour analysis, brightness measurement, gradient mapping, centre detection, and calculations of symmetry, fractal dimension and spectral characteristics. This would connect the experiments with the methodology of Chapter 22. The chemical system would become a source of images for morphological records, fractal analysis and statistical testing.

Comparison between experiment and computation may play a special role. Ideally, three levels could be established for the same type of pattern: a numerical reaction–diffusion model, a laboratory chemical experiment and a natural object. Examples might include modelled spots—chemical spots—biological spotted patterns; modelled stripes—chemical labyrinths—natural striped structures; and modelled spirals—chemical spiral waves—natural spiral structures. If all three levels are compared using identical parameters, the hypothesis becomes considerably more rigorous. It no longer depends solely upon visual impressions, but establishes a sequence: rule—experiment—natural form—measurement.

Excessively broad conclusions must nevertheless be avoided. Even if a chemical system produces spirals, this does not mean that a galactic spiral has a reaction–diffusion origin. Even if chemical rings resemble a cultural mandala, this does not mean that the mandala arose from a chemical process. The correct conclusion is different: particular morphological regimes—ring, spiral, stripe, spot and active front—may arise within different types of systems through different mechanisms. A chemical experiment demonstrates one mechanism of self-organisation that helps to clarify the general logic of pattern formation.

This approach preserves the scientific rigour of the hypothesis. Experimental work should not become a search for ‘evidence at any cost’. It should test individual propositions. Can simple reaction–diffusion systems generate patterns morphometrically comparable with particular natural structures? How robust are these patterns when parameters change? Can they be classified according to the same features as BIO–GEO–COS objects? Do centres, layers, active edges, spirals and stripes emerge in the laboratory as reproducible regimes? These questions are specific and testable.

A general experimental protocol may be proposed. First, a chemical system is selected and its conditions recorded. The geometry of the medium and its initial state are then specified. A series of experiments is conducted in which one parameter is varied while the others remain constant. Every experiment is recorded over time. The images are subsequently processed according to a common protocol: spots, stripes, rings, fronts and edges are extracted; morphometric indicators are calculated; and graphs of their dynamics are constructed. The results are then compared with numerical models and control experiments. The final outcome should be not a general philosophical conclusion, but a specific statement concerning the type of pattern and its parameter range.

Reproducibility is an important aspect. A single successful experiment producing a beautiful spiral or ring is insufficient. It must be demonstrated that the pattern recurs under the same conditions or within a predictable range. If the result depends upon accidental contamination, an unstable regime or unaccounted-for factors, its significance is limited. The experimental programme should therefore include repetitions, control samples, descriptions of conditions and precise records of time, temperature, concentrations, layer thickness and imaging method. Only then will the chemical model become scientific material rather than a demonstration.

Chemical reaction–diffusion systems also make it possible to study the boundaries between order and chaos. Under one set of parameters, a system may produce regular spots; under another, chaotic spots; under a third, stripes; and under a fourth, a complex labyrinth (*Fig. 1*). This is especially important to the Matrix hypothesis because the form of the world is neither perfectly geometric nor entirely random. It frequently exists between strict order and variable complexity. Laboratory systems make it possible to observe how such an intermediate regime arises from dynamic parameters.

In the future, an experimental atlas of reaction–diffusion patterns could be created. It would contain images, medium parameters, time series, morphometric indicators, fractal dimensions, pattern classifications and comparisons with numerical models. Such an atlas could form a separate section of the general BIO–GEO–COS database under the designation EXP—experimental patterns. The Matrix would then be examined not only through natural and cultural images, but also through forms generated in the laboratory. This would strengthen the research programme considerably.

It is important to emphasise that chemical reaction–diffusion experiments constitute only one direction of investigation. They are particularly well suited to field patterns: spots, stripes, waves, rings and spirals. They are less suitable for modelling the complete growth of a tree, an actual leaf, a complex biological tissue or a cosmic structure. These tasks will require biological, geological and cosmological data and computer-vision methods, which will be considered in the following sections. Chemical systems are nevertheless useful as the first laboratory level because morphogenesis can be observed directly within them and their parameters can be controlled.

Thus, chemical reaction–diffusion systems make it possible to test experimentally the emergence of patterns within controlled laboratory media. They can generate spots, stripes, waves, rings, spirals, active fronts and complex boundaries. These forms do not constitute proof of the entire Unified Matrix of the Universe hypothesis, but they provide important material for testing individual morphogenetic principles: self-organisation, centredness, layering, the active edge, transitions between regimes and the dependence of form upon environmental parameters.

Chemical reaction–diffusion experiments should therefore be regarded as the first experimental step in the scientific investigation of the Matrix.

24.2. Biological Models

Biological models occupy a central place within the experimental programme for testing the Unified Matrix of the Universe hypothesis because morphogenesis is manifested with particular clarity in living systems. A leaf, flower, seed, bud, root, tissue, mycelium, coral, vascular network, neural branching structure, colony of microorganisms or growing biofilm does not merely possess a form. It undergoes a process of becoming: it grows, branches, folds, opens, responds to its environment, changes its contour, and creates internal networks and active edges. Biological objects may therefore serve not only as illustrations of the Matrix, but also as real experimental material for the analysis of morphogenesis.

Biological models are considerably more complex than chemical reaction–diffusion systems. They involve genetic regulation, cell division, tissue differentiation, growth mechanics, the transport of substances, hormonal signals, interaction with the external environment, inherited programmes and random deviations. Biological form cannot therefore be explained through a single universal mechanism. It is precisely this complexity, however, that makes biological systems especially important. They make it possible to test whether the proposed morphological invariants of the Matrix persist under conditions of living growth: centre, axis, branching, layering, symmetry, asymmetry, fractality, active edge, opening, cyclicity and a return to seed-like potentiality.

Leaves should constitute the first object of biological analysis. The leaf is convenient for research because it combines several key features: a central vein or system of principal veins, lateral branching, an external contour, an active edge, a surface and, in some cases, pronounced symmetry or, in others, strong asymmetry. A leaf can be photographed, scanned, measured and compared across species, growth stages, environmental conditions and types of damage. Its morphometric features can readily be identified: blade length and width, the position of the central axis, the angles of lateral veins, branching order, venation density, edge shape, degree of serration, fractal dimension of the contour and asymmetry between the left and right sides.

The analysis of venation is especially important. Leaf veins form an internal network that may be pinnate, palmate, reticulate, arcuate, parallel or mixed. This network performs biological functions: transporting water, minerals and the products of photosynthesis, while mechanically supporting the leaf blade. At the same time, it constitutes a morphological structure that may be compared with other networks: drainage basins, roots, vascular systems, cracks and filamentary cosmic structures. Such comparison must be strictly confined to the level of form. The mechanisms differ, but the parameters of branching, nodes, angles, orders and network density can be measured and compared.

The leaf also makes it possible to investigate the active edge. Its edge may be smooth, undulating, serrated, lobed, deeply divided or fractal-like. Its form depends upon the plant species, developmental stage, growth conditions, damage, adaptations and genetic characteristics. For the Matrix hypothesis, it is especially important that the leaf edge is often the zone where internal organisation encounters the external environment. It records the balance among surface growth,

venation, mechanical stress and ecological conditions. The leaf edge may therefore serve as a model of the active boundary of a living form.

Flowers constitute the second key object. The flower is especially important for analysing radiality, centre, layering, opening and symmetry. It possesses a centre, petals and rows of elements; it may have a pronounced axis and either radial or bilateral symmetry. The flower may be investigated both as a completed structure and as a process: from bud to opening, from the open state to wilting, and from flowering to fruit and seed. This makes it one of the best biological models of A–B–C–D. The bud corresponds to a closed potential structure; the beginning of opening, to transition; the open flower, to a manifested multilayered form; and fruit and seeds, to a new cycle.

Experimental analysis of a flower requires its stages of opening to be recorded. A series of photographs may be taken of the same flower at regular intervals, measuring the opening angle of its petals, visible area, number of open layers, changes in its radial profile, petal curvature, edge asymmetry, the position of the centre and the rate of opening. Such data would make it possible to construct an actual temporal trajectory of the form. This could then be compared with the model of folding and opening proposed in Chapter 23. The image of bud and flower would thereby cease to be merely metaphorical and become a measurable biological process.

Particular attention should be paid to the lotus and other aquatic or many-petalled plants. The lotus has already been examined as a cultural model of opening, but it may also serve as a biological research object. It combines an aquatic environment, vertical stem, bud, open flower, central seed structure and return to a new cycle. It may be analysed according to the same parameters: degree of opening, number of petal layers, radiality, edge activity, position of the seed region and relationship between centre and periphery. The cultural symbolism of the lotus must be distinguished from its biological analysis. Biology provides the actual parameters of form; culture provides a hermeneutic layer.

Seeds constitute the third object. Throughout this book, the seed has served as one of the principal images of concealed potentiality. Within biological research, however, it should be considered not only metaphorically, but as a concrete structure. A seed possesses a coat, internal tissues, an embryo, nutrient reserves, a form, a surface and microrelief, and sometimes complex symmetry or asymmetry. Seed germination may be investigated as a transition from a closed state to axial growth. Initially, the coat preserves the internal structure in a compact form. Swelling, rupture, the root, shoot and first leaves then appear. This provides an almost ideal biological sequence of A–B–C–D.

The germination of seeds from different species may be observed experimentally under controlled conditions of humidity, temperature, illumination, medium composition and time. The moment at which the coat ruptures, the rate at which the root emerges, shoot length, growth angle, rupture asymmetry, changes in the shape of the seed coat and the appearance of the first branches can all be measured. Such analysis would make it possible to test how a closed potential structure transitions into axial and then branching growth. The seed thereby becomes not only an image, but also a laboratory model of morphogenetic opening.

Plant tissues and the tissues of organisms more generally constitute the fourth object. At the microscopic level, it is possible to investigate cellular structures, cell distributions, vascular bundles, epidermal patterns, growth zones, meristems and the tissues of leaves, stems, roots and petals. The relationship between local cellular growth and the overall form of an organ is especially important here. Uneven cell division and expansion, for example, may produce bends,

folds, waves and marginal deformations. Such processes are directly connected with models of folding and opening. If the edge of a tissue grows more rapidly than its interior, it may form waves and folds. If growth is directed along an axis, an elongated form emerges. If growth is radial, a rosette or circular structure may appear.

Tissue models are particularly important because they reveal an intermediate level between a chemical pattern and an entire organism. Gradients, growth fields, mechanical stresses, cellular networks and local zones of activity may all be manifested within tissues. Some of these processes may be described through reaction–diffusion, mechanical or growth models. Tissues therefore constitute a natural bridge among laboratory chemistry, numerical modelling and the morphology of living organs. This is an important level for the Matrix hypothesis because form does not immediately emerge as a complete leaf or flower, but through the distribution of processes within living material.

Fungi and mycelial networks constitute the fifth object. A mycelium is a network structure that spreads through a substrate. It may branch, reconnect, form dense regions, fractal-like edges, radial colonies, growth rings and active peripheries. Mycelial growth is especially convenient for experimental observation because many fungi can be cultivated on nutrient media in Petri dishes while changes in the colony are recorded over time. During the early stages, a centre appears. Filaments then extend outwards from it. The periphery becomes an active zone of growth. Over time, a complex network forms. Rings, sectors, and dense and diffuse regions may also emerge.

The mycelium is particularly important to the model of the Matrix as a network form. Centre and periphery, branching and connection, growth and resource exploration, the active edge and fractal complexity are all manifested with particular clarity. Analysis may measure the radius of the colony, rate of peripheral growth, filament density, branching angles, number of nodes, fractal dimension of the edge, degree of radiality and asymmetry of growth under different environmental conditions. By changing nutrients, humidity, temperature or the presence of obstacles, it is possible to observe how the same living system changes its morphology. This makes the mycelium an especially valuable biological model.

Corals and colonial organisms constitute the sixth object. Coral structures frequently display branching, radiality, repetition of modules, colony growth, fractal-like complexity and an active periphery. They occupy an intermediate position between an individual biological form and a collective structure. A coral is not a tree, but many coral forms possess tree-like or bush-like morphologies. Others form massive, plate-like, dome-shaped, brain-like or reticular structures. Corals are important to the Matrix hypothesis because they demonstrate how modular growth may create a complex form at the boundary between organism and environment.

Corals may be investigated through photographs, three-dimensional models, scans, branching morphometry, surface analysis, fractal dimension, colony density and growth parameters. It is important to recognise that the form of a coral depends upon water, light, depth, currents, symbiotic organisms, competition, damage and ecological conditions. Coral therefore demonstrates especially well that the Matrix does not operate in isolation. A morphological invariant of branching or modular growth is realised through a particular environment. This is fundamental to the hypothesis as a whole: form is always the result of interaction between an internal algorithm and an external field of conditions.

Vascular structures constitute the seventh object. In living organisms, vascular networks transport blood, lymph, water, nutrients, gases and metabolites. They branch, form hierarchies, contain principal channels and fine capillaries, and connect centre with periphery. Vascular

structures are especially important for comparisons with trees, roots, river networks and leaf venation. It is possible to measure vessel diameter, branching angles, branching order, network density, segment length, flow distribution and the relationship between large and small channels. This constitutes some of the most rigorous biological material available for analysing network invariants.

Vascular structures must nevertheless be approached cautiously. They perform specific physiological functions and develop through complex biological mechanisms. It is insufficient merely to say that a vascular network ‘resembles’ a river or tree and draw a philosophical conclusion from this. Parameters must be compared: network topology, diameter distributions, branching angles, transport efficiency, node density and hierarchy across scales. The comparison then becomes scientifically meaningful. In this sense, vascular structures may provide one of the most convincing biological fields for testing the morphological component of the hypothesis.

Neural structures and the organism’s neuronal networks may constitute the eighth object. Neurons possess a cell body, dendrites, an axon, branches and connections. At the tissue level, the nervous system forms complex networks. This is of interest to the Matrix as an example of biological organisation in which branching is associated not only with the transport of matter, but also with the transmission of signals. This material requires even greater caution, however, because the functional and morphological complexity of neural tissue is extremely high. Initial work should therefore be confined to straightforward morphometric tasks: analysing dendritic branching, process length, number of nodes, the fractal complexity of dendritic trees and the distribution of connections.

Colonies of microorganisms and biofilms constitute the ninth object. They may form concentric rings, dendritic edges, spotted structures, growth waves, folds, fractal colonies and labyrinthine forms. Such models are especially interesting because they can be cultivated in the laboratory and recorded over time. A colony begins from a small centre, spreads across a medium, forms an active edge and responds to nutrients, humidity, competition and constraints. This makes it an almost ideal object for analysing centre, periphery, active edge and the transition from a localised point to a complex structure.

Biological models should be investigated according to a common protocol. For every object, it is necessary to record its type, species, developmental stage, growth conditions, scale, imaging method, data quality and environmental parameters. Its morphological features are then identified: centre, axis, layers, branching, symmetry, contour, active edge, fractal dimension, degree of opening, number of levels and asymmetry. Quantitative analysis can subsequently be conducted. This approach will connect biological data with the general BIO–GEO–COS database proposed in Chapter 22. The biological component should become the richest and most methodologically reliable section of this database.

It is especially important to work with time series. Living forms change. A leaf grows and unfolds. A flower opens. A seed germinates. A mycelium spreads. A bacterial colony forms an edge. A coral extends its skeleton. A vascular network develops within tissue. Biological research should therefore record not only final appearance, but also process. If only the completed image is analysed, morphogenesis is lost. For the Matrix hypothesis, transitions are fundamental: closed—opening—open—new potentiality.

A morphological trajectory can be constructed for every biological object. During seed germination, for example, closure decreases, the degree of opening increases, an axis appears

and the first branches or leaves subsequently emerge. During the opening of a flower, the petal angle, number of visible layers, edge activity and radiality increase. In a mycelium, the colony radius, fractal complexity of the periphery and network density increase. In a leaf, area increases, venation becomes more complex and the contour changes. These trajectories may then be compared with the numerical A–B–C–D model. Biological models thereby become not only objects, but also test series.

Biological experiments also make it possible to investigate environmental influence. The same plant species may produce different leaves under different conditions of illumination, humidity, nutrition or damage. A mycelium changes its form according to its medium. Colonies of microorganisms grow differently at different nutrient concentrations. Corals alter their morphology in response to currents and illumination. This is especially important to the Matrix hypothesis because it demonstrates that an invariant of form does not exist independently of conditions. The Matrix may establish a possible type of organisation, but the actual form is always the result of interaction between an internal programme and an external environment.

An important distinction therefore arises among genetic, physical and morphological levels. Genetics may establish the organism's biological possibilities. Environmental physics may constrain growth. Morphology records the resulting form. The Matrix hypothesis should not replace genetics or physiology. It should operate at the level of morphological relationships: centre, axis, branching, layers, edge and opening. Biological models will help to test how stable these relationships remain under changing conditions and how strongly they depend upon particular developmental mechanisms.

The comparison of natural and modelled biological forms will be an important direction. Real leaves, for example, may be compared with L-systems; actual fungal colonies with fractal iterations and growth models; the opening of a flower with a model of folding and opening; and tissue pigmentation patterns with reaction–diffusion models. Such comparisons must be based upon parameters rather than overall impressions. If a model reproduces branching angles, number of levels, fractal dimension and contour complexity, it is significant. If it merely looks similar, its value is limited.

Biological models also make it possible to identify strong and weak features of the Matrix. Branching and the active edge may prove highly stable among mycelia, roots, leaves and vessels. Radiality and layering may be strong features of flowers and lotuses. Closure and opening may be strong features of seeds, buds and fruits. Some features, however, may be weak or absent within particular objects. This is normal. The hypothesis should not require every feature to be present everywhere. It should identify morphological families and their parameters.

Several pilot series may be proposed for the experimental programme:

- The first series would examine the germination of seeds from different species using time-lapse photography and analyses of seed-coat rupture, the growth axis and initial branching.
- The second would examine the opening of flowers by measuring petal angle, area, layers, radiality and the active edge.
- The third would investigate leaf growth through analyses of venation, contour and asymmetry.
- The fourth would investigate mycelial growth on different nutrient media, measuring radius, edge fractality and network density.
- The fifth would analyse vascular or leaf networks as graphs.
- The sixth would compare coral forms according to their branching and surface parameters.

Each of these series may be connected with a specific question. Does the fractal dimension of the edge increase as a flower opens? How does leaf symmetry change during growth? How stable are branching angles within leaf venation? How does nutrition affect the fractality of the mycelial edge? Do actual vascular networks differ from random networks in their branching hierarchy? Which parameter best describes the transition from bud to flower? Such questions make the biological section testable rather than merely descriptive.

The visual illustration accompanying this section might present biological models as a set of experimental objects (*Fig. 2*). It would be logical to include several components: a leaf with visible venation, a flower or lotus at different stages of opening, a seed with a shoot, a mycelium in a Petri dish, a coral structure and a vascular network. Shared measurable features could be indicated between them: centre, axis, branching, layers, active edge and fractal complexity. The illustration should emphasise that the subject is not a beautiful biological atlas, but a corpus of living forms suitable for morphometric analysis.

It is especially important that the biological illustration should not imply that all these forms are 'the same'. They are not. Leaves, flowers, seeds, mycelia, corals and vascular networks involve different mechanisms. They may nevertheless be described according to a common set of features. This is the methodological essence of the chapter. The biological level is especially rich because it contains different types of Matrix: axial-network, radial-layered, folded-opening, fractal-peripheral, vascular-branching and colonial-growth forms.

The conclusion of this section may be formulated as follows. Biological models constitute one of the most important experimental directions for the Unified Matrix of the Universe hypothesis because living forms make it possible to observe morphogenesis over time. Leaves, flowers, seeds, tissues, fungi, corals, vascular structures, colonies of microorganisms and other biological objects may be investigated through morphometry, fractal analysis, graph analysis of branching, and analyses of symmetry, the active edge and stages of opening. They do not directly prove the philosophical meaning of the Matrix, but provide a rich body of material for testing its morphological invariants within real living systems.

24.3. Geological and Geophysical Data

Geological and geophysical data constitute the next major experimental and observational block for testing the Hypothesis of the Unified Matrix of the Universe. If chemical systems make it possible to study patterns in a controlled laboratory environment, and biological models provide material for analysing living growth, then geological and geophysical structures allow morphogenesis to be examined at the level of the Earth's surface, the lithosphere, relief, drainage networks, faults, folds, coastlines, craters, deltas, volcanic forms and erosion systems. This is a fundamentally different scale and a different type of process. Here, form arises not through cell division or a chemical front, but through tectonics, erosion, sedimentation, gravity, water flow, weathering, volcanism, glacial dynamics, faulting and long geological time.

The geological level is especially important for the Matrix hypothesis because it makes it possible to test whether morphological invariants are preserved beyond living growth. In biology, a tree, leaf, flower, mycelium or vascular network may be explained by the internal programmes of an organism. Relief, a river network, a fold, a fault, a crater, a geode or a coastline, however, are not organisms. If an axis, branching, layering, an active edge, fractal complexity, centricity, radiality,

shell-like organisation or recurrent structures are found in them, this indicates that such features may also arise in non-living matter. Such similarity, however, must not be understood as identity of mechanisms. Geology requires its own explanatory language.

The main sources of data for such analysis may include satellite imagery, aerial photography, digital elevation models, geological maps, fault maps, river-network maps, catchment models, remote-sensing data, topographic maps, geophysical fields, seismic sections and three-dimensional surface models. These data allow work to be carried out not with isolated attractive photographs, but with measurable spatial structures. This is the major advantage of the geological block: relief, channels, faults and coastlines can be analysed quantitatively, in coordinates, at a known scale and often across large territories.

The first and most obvious object is river networks. They are extremely important for comparative morphology because they demonstrate branching, hierarchy, main channels, tributaries, junction nodes, catchment basins, active valley edges and large-scale organisation. A river network may be compared with leaf venation, a root system, a vascular network and certain filamentary structures, but only at the level of form parameters. In geomorphology, a river network arises under the influence of relief, precipitation, erosion, lithology, tectonics, climate and time. These mechanisms cannot be replaced by biological analogies. The structure of branching itself, however, can be measured and included in a general database of morphological features.

For the analysis of river networks, one may use parameters such as stream order, segment length, confluence angles, drainage density, catchment area, the relation between the main channel and its tributaries, branching hierarchy, the fractal dimension of the network, basin asymmetry, and the shape of a delta or valley. A graph-based approach is especially important: channels can be represented as a network of nodes and edges. Nodes are points where tributaries join, sources, mouths, bifurcations and points of directional change. Edges are channel segments between nodes. This approach makes it possible to compare a river network with other branching structures not visually, but through topological and metric indicators.

The second object is valleys and catchment basins. They show not only a network of lines, but also the form of a space organised around flow. A valley has an axis, slopes, terraces, side ravines, a channel, a catchment boundary, and active zones of erosion and accumulation. A catchment basin may be regarded as a geomorphological analogue of a leaf blade: within it, a network of channels develops, while the outer contour limits the area of water collection. This comparison does not imply biological identity, but it is morphologically productive. In both cases, there is an area, central or principal lines, lateral branching, an edge and the internal distribution of flows.

Digital elevation models are particularly useful for such analysis. They make it possible to extract channel networks, calculate slope gradients, slope aspect, surface curvature, flow lines, watersheds, local depressions, terrace levels and valley forms. On the basis of such models, one can construct gradient maps, maps of erosional dissection, valley profiles, relief sections and three-dimensional visualisations. This makes it possible to move from a conventional image to a quantitative description of geomorphological form. For the Matrix hypothesis, this is especially important because relief parameters can be compared with parameters of biological and cultural forms according to a unified protocol.

The third object is faults and fracture networks. They demonstrate another type of branching: not growth-based and not hydrological, but stress-related and rupture-based. A fault structure may

contain main lines, lateral branches, shear zones, intersections, segmentation, hierarchy, fractal complexity, asymmetry and active edges. Fracture networks in rocks, dried clays, glaciers, lava surfaces or rock massifs can also be represented as graphs. Their parameters—fracture lengths, intersection angles, density, orientation, size distribution and fractal dimension—make it possible to analyse how material releases or redistributes internal stress.

Faults are especially important for the model of folding and disclosure. In a closed or stressed structure, energy may accumulate up to a threshold, after which a crack or rupture appears. In a morphological sense, this is not the soft disclosure of a flower, but the hard disclosure of material through damage. Here, the A–B–C–D model takes on a different form: A is a stressed wholeness, B is the appearance of a crack, C is a developed fault network or disclosed surface, and D is a new structural organisation, displacement of blocks, the emergence of secondary fractures or a new edge. This type of disclosure is important because the Matrix must not be reduced only to smooth biological beauty. It must also include rupture forms of non-living matter.

The fourth object is folds and layered geological structures. Geological strata, sedimentary layers, fold belts, bends in rocks, stratified sections, flysch formations, lava flows, glacial layers and sedimentary structures provide material for analysing layering, axis, curvature, recurrence, compression and deformation. In them, one can measure layer thickness, dip angles, radii of curvature, fold amplitude, wavelength, degree of disturbance, recurrence of strata, and the relationship between folds and faults. Layering here is not a symbol, but the result of geological processes. Morphologically, however, it is connected with the general invariant of the levelled organisation of form.

Folded structures show particularly well that a layer may be not only a static level, but also a trace of a process. Sedimentary strata record the sequence of material accumulation. Folds record subsequent compression and deformation. Faults record the disruption of wholeness. Erosion reveals internal layers at the surface. A geological object is therefore often an archive of time. For the Matrix hypothesis, this is important: form does not merely exist in space; it also carries the memory of its stages. In this sense, geology provides powerful material for understanding form as a frozen process.

The fifth object is craters, ring structures, volcanic forms and geodes. They are important for the analysis of centre, radiality, shell, concentric layers and active boundary. A crater has a centre or a zone of impact or eruption, a ring boundary, rims, sometimes secondary rings, radial ejecta or fractures. A volcanic form has a cone, vent, lava flows, radial slopes, crater and layers of eruptions. A geode has an external stone shell and an internal crystalline structure. All these objects may be included in the group of centred-shell forms, but with a compulsory indication of their specific origin.

Ring-shaped and radial geological structures are useful for comparison with the flower, lotus, mandala, planetary shell and nebula, but it is precisely here that maximum caution is required. A crater is not a flower. A volcano is not a lotus. A geode is not a sacred diagram. Yet all of them may have a centre, shell, layers, active edge and radial distribution. These features can be measured: radius, ring thickness, symmetry, asymmetry, number of layers, edge form, fracture distribution, and the relationship between the central zone and the periphery. It is at this level that comparison becomes scientifically correct.

The sixth object is coastlines and the boundaries of landscape forms. A coastline is a classic example of a complex edge. Its length depends on the scale of measurement; its contour may have a fractal-like structure; and its form develops under the influence of waves, currents,

lithology, erosion, sedimentation, water level, climate and time. For the Matrix hypothesis, the coastline is especially important as a model of an active edge where land and water interact continuously. Here, the edge does not simply separate one area from another. It is a dynamic zone of exchange, destruction, accumulation and change.

The analysis of coastlines may include fractal dimension, curvature, sinuosity, the ratio of contour length to the area of the coastal zone, the distribution of bays and protrusions, the hierarchy of inlets, the recurrence of headlands, and changes over time. A coastal contour can be compared with the edge of a leaf, nebula, cloud, flame, chemical front or cultural ornament, but again only according to parameters of form. Such analysis shows clearly that the concept of an active edge may have physical, biological, chemical and cultural expression without being reduced to a single mechanism.

The seventh object is desert, glacial and aeolian forms. Dunes, barchans, wave-like sand ridges, glacial grooves, moraines, glacier fractures, snow structures, wind patterns and sedimentary ripples demonstrate periodicity, banding, wave organisation, movement fronts and recurrent edges. They are especially important for comparison with reaction–diffusion and wave models, although their mechanisms are connected with the flow of air, ice, water, particles and gravity. In them, one can measure wavelength, amplitude, orientation, regularity, density, crest curvature and direction of migration. This is a geophysical analogue of environmental patterns.

The eighth object may be geophysical fields: magnetic, gravitational, thermal, seismic and density anomalies. They do not always provide visible form in the ordinary sense, but when mapped they turn into spatial patterns: isolines, gradient zones, anomaly centres, bands, rings, fault correlations and spot-like fields. Such data require particularly cautious handling because visualisation depends on the method of processing, interpolation, scale and colour scale. Nevertheless, they may be useful for analysing hidden structures of the Earth that are not directly visible on the surface, but manifest themselves through fields.

For the Matrix hypothesis, geophysical fields are especially interesting because they show invisible morphology. Relief is a visible surface. A field is the distribution of a value in space. If centres, gradients, bands, rings, axes and active zones appear in such fields, this expands the concept of form. Form is not always the contour of an object. It may be the distribution of a parameter. This is precisely what connects geophysical data with chemical reaction–diffusion models and cosmological maps of matter distribution.

A special protocol is needed for working with geological and geophysical data. First, the type of data should be recorded: satellite image, digital elevation model, geological map, fault map, hydrographic network, geophysical field or seismic profile. Secondly, scale, resolution, projection, source and processing method must be recorded. Thirdly, morphological elements should be identified: contour, axis, centre, layers, network, nodes, edge, gradients and zones of activity. Fourthly, morphometric and fractal analysis should be carried out. Fifthly, the results should be compared with control areas and with other types of objects.

Control areas are especially important. If the researcher selects only the most beautiful river networks or the most expressive craters, they will obtain confirmation of a pre-selected idea. It is therefore necessary to work with samples. For example, one may take a random set of catchment basins from one region, a set of coastal sections with different geological conditions, a series of fault networks, multiple craters of different sizes, different types of dunes, and various sections of a digital elevation model. The features can then be compared. Only in this way is it possible to understand how stable the morphological invariants are and where they truly appear.

Geological data also make it possible to test scale invariance. The same relief can be analysed at different scales: from a local ravine to a river basin, from a coastal section to a regional coastline, from a single fracture to a fault zone. If certain features are preserved as scale changes, this is an important result. If they disappear, that is also important. Geology is especially suitable for such analysis because it is available at different scales: field photograph, aerial photograph, satellite image, regional map and global model.

Three-dimensionality is of particular significance. Many geological forms cannot be properly understood from a flat image alone. Relief has heights, slopes, profiles, depths and volumes. A fault has dip and displacement. A fold has amplitude and geometry in section. A volcano has volumetric form. A geode has an external shell and an internal cavity. The geological block should therefore include not only two-dimensional image analysis, but also three-dimensional morphometry: profiles, surfaces, volumes, curvature, gradients and bedding orientation. This expands the possibilities for testing the hypothesis.

A visual illustration for this section may show the main types of geological and geophysical data (*Fig. 3*). It would be logical to include a satellite image of relief, a digital elevation model, a river-network map, a fault map, a ring structure or crater, a coastline and a geophysical field. All of them should be connected with unified morphological features: axis, branching, layer, active edge, centre, radiality and fractal complexity. Such an illustration should look like an analytical data panel rather than a landscape selection.

It is especially important that the geological illustration maintain scientific neutrality. It should not suggest that a river, a leaf and a cosmic structure are one and the same thing. This subsection concerns the Earth as an independent level of form formation. The Earth's surface has its own processes, but these processes can generate structures suitable for comparative morphology. The illustration should therefore show not mystical similarity, but research material: maps, networks, contours, sections, fields and parameters.

Geological and geophysical data are especially valuable also because they often already exist in large open datasets. Unlike biological experiments, which must be conducted specifically, many satellite images, digital elevation models, river, relief, fault and geophysical field maps are available for analysis. This means that the Matrix hypothesis can be tested on big data. It is possible to analyse thousands of river basins, hundreds of craters, tens of thousands of coastline contours, regional fault networks and global relief models. Such a scale of analysis would significantly increase the scientific seriousness of the research.

Big data, however, require rigorous methods. The larger the dataset, the greater the risk of false correlations and visual illusions. The geological block should therefore use statistical testing, control groups, automatic annotation, reproducible algorithms, comparison of regions, and assessment of errors and limitations. Methods of computer vision and machine learning, which will be considered in the next section, are particularly important here. They can help automatically identify channels, faults, edges, rings, layers and other structures.

Geological data also help to test the limits of the hypothesis. Some invariants of the Matrix may prove to be clearly expressed in river networks and coastlines, but weakly expressed in chaotically fractured rocks. Radiality may be strong in craters and volcanoes, but rare in folded structures. Layering may be evident in sedimentary sections, but absent in intrusive igneous bodies. Such results would be important. They would make it possible not to expand the hypothesis without measure, but to refine it according to types of processes and morphological families.

Thus, geological and geophysical data make it possible to test the morphological invariants of the Matrix at the level of non-living terrestrial matter. Satellite images, relief maps, digital elevation models, maps of faults, river networks, coastlines, craters, folds and geophysical fields provide material for analysing axes, branching, layering, active edges, radiality, fractal complexity and structural correlations. These data do not prove the philosophical universality of the Matrix, but they make it possible to test the extent to which its presumed features appear in terrestrial processes distinct from biological growth and cultural imagery.

24.4. Cosmological Data

Cosmological data constitute one of the most complex and simultaneously most expressive levels at which the Unified Matrix of the Universe hypothesis may be tested. Whereas biological models make it possible to observe living growth, and geological and geophysical data provide material for analysing terrestrial forms, the cosmological level transfers the question of morphological invariants to a radically different scale. Here, the objects include nebulae, galaxies, clouds of gas and dust, supernova shells, spiral arms, filamentary structures, star clusters, protoplanetary discs, planetary surfaces, maps of matter distribution and fields within the cosmic medium. These objects cannot be treated as direct analogues of biological or cultural forms. They may nevertheless be incorporated into comparative morphology through rigorously defined features: centre, shell, layer, spiral, filament, active edge, radiality, asymmetry, scale-dependent complexity and density distribution.

Cosmological material requires an especially high degree of methodological caution. Images of space frequently produce a powerful visual impression. A nebula may resemble a flower, a galaxy a spiral shell, a star cluster a seed-like structure and a supernova shell an open bud or radial mandala. Such similarities, however, can easily become a source of arbitrary analogies. The present study must therefore emphasise continually that cosmological images do not prove that the Universe is literally constructed as a flower, tree or lotus. They constitute data concerning the distribution of matter, energy, radiation, gas and dust, gravitational interactions, shock waves and the dynamics of the cosmic environment. Comparison is possible only at the level of morphological parameters.

Nebulae constitute the first major object of analysis. They are especially important to the Matrix hypothesis because they frequently display shells, filaments, layers, active edges, central sources, radial structures and complex boundaries. Some nebulae possess a pronounced central region surrounded by gaseous shells. Others contain elongated filaments, arcs, waves, fronts and asymmetrical outflows. Still others appear as complex cloud-like structures without an evident centre. These variants should not be analysed collectively as a single ‘cosmic flower’, but as different morphological types of cosmic matter.

For nebulae, it is possible to measure brightness distribution, the shape of the external contour, the presence of a central source, radiality, shell thickness, filamentarity, degree of asymmetry, fractal dimension of the edge, the distribution of dense and diffuse regions, the character of gradients and the number of visible layers. Analysis of the active front—the region in which luminosity, density or structure changes sharply—is especially important. Such a front may be associated with a shock wave, stellar radiation, interaction between gas and its surroundings or

dynamic expansion. Morphologically, it resembles the active edge already discussed in chemical, biological and geological systems.

When analysing nebulae, however, it must be remembered that an image is not always a direct photograph in the ordinary human sense. It is frequently a processed visualisation of data acquired at different wavelengths. Colours may be artificial, enhanced or composited. Different telescopes and processing methods reveal different structures. For every cosmic image, it is therefore necessary to record the data source, observational wavelength, processing method, scale, resolution and physical nature of the object represented. Without this information, morphological comparison may be unreliable because the visible structure will depend not only upon the object, but also upon the method of visualisation.

Galaxies constitute the second object. Spiral galaxies are especially important because they display a centre, disc, arms, rotational organisation, asymmetry, density waves, and stellar and gaseous structures. The spiral has appeared repeatedly throughout the book as a stable morphological motif connecting movement, centre, rotation and propagation. A galactic spiral, however, possesses its own astrophysical mechanism and cannot be reduced to a biological spiral, shell, plant growth or cultural ornament. The correct question is: which parameters of spiral organisation can be measured and compared with other spiral forms?

For galaxies, it is possible to analyse the number of arms, pitch angle, symmetry, asymmetry, brightness of the central region, density distribution across the disc, the degree of flocculence or organisation of the arms, the relationship between the central bulge and the periphery, and the presence of a bar, rings, filaments or disturbances caused by satellite galaxies. Here, the spiral is not a decorative curl, but a spatial organisation of matter within a gravitational system. Its morphometric parameters may nevertheless be incorporated into a general comparative analysis of spiral forms—not to prove a common mechanism, but to describe recurring geometric relationships.

Clouds of gas and dust and star-forming regions constitute the third object. They are especially interesting because their forms are not always stabilised. They contain filaments, dense cores, cavities, shells, waves, fronts, compressed zones and diffuse regions. These are dynamic structures associated with gravity, turbulence, magnetic fields, radiation, shock waves and star formation. Morphologically, they are important as examples of a transition from a distributed cloud to localised centres of concentration. In terms of the A–B–C–D model, it is possible to speak cautiously not of a completed cycle, but of the emergence of centres within a field.

Clouds of gas and dust make it possible to investigate one of the fundamental motifs of the Matrix: the transition from field to centre. In a chemical reaction–diffusion system, a spot may emerge against a homogeneous background. In biology, a seed or growth point organises development. Within the cosmic medium, dense cores may form inside a broader cloud. The mechanisms are, of course, different. The morphological operation—the appearance of a localised concentration within a distributed medium—may nevertheless be compared. Such comparison requires measurements of density distribution, the number of local maxima, core sizes, distances between them, filamentary connections and degree of clustering.

Supernova shells and other expanding cosmic structures constitute the fourth object. They are important for analysing radial propagation, ring-shaped forms, layering, fronts, ruptures, asymmetry and the active edge. A supernova remnant may appear as an expanding shell with bright filaments and an irregular periphery. Morphologically, this is an extremely valuable object: it possesses an event centre, an expanding front, a boundary interacting with the surrounding

medium, ruptured edges and internal heterogeneity. It is not, however, a flower or mandala, but the physical trace of an explosive process.

For such shells, it is possible to measure radius, thickness, asymmetry, edge fragmentation, fractal dimension of the periphery, distribution of bright filaments, deviation from sphericity, the presence of secondary shells and the relationship between centre and edge. These parameters may be compared with those of other shell-like forms: geological craters, chemical rings, biological fruits and cultural mandalas. The comparison must remain morphological. The strength of such analysis lies precisely in its refusal to conflate different physical processes while demonstrating the recurrence of formal relationships: centre—shell—front—edge—asymmetry.

Filamentary structures on cosmic scales constitute the fifth object. Networks, threads, nodes, voids, concentrations and connections may emerge within the distribution of gas, dust, stellar regions and large-scale matter. These structures are especially interesting for comparison with biological and geological networks: leaf venation, roots, mycelia, vascular systems, river networks and cracks. Such comparison requires even greater caution because cosmic filaments form through entirely different physics. At the level of graph morphology, however, it is possible to analyse nodes, edges, connection density, segment lengths, clustering, hierarchy and scale-dependent structure.

Filamentarity may prove to be a strong cross-level feature of the Matrix if it is formalised. It is insufficient merely to state that a cosmic network ‘resembles’ a mycelium or neural network. A graph must be constructed, its nodes identified and the lengths, angles and density of its connections, degree distribution, fractal dimension, connectivity, and the sizes of cells or voids measured. Only then is structural comparison possible. If such parameters prove similar or at least typologically comparable across different systems, this would constitute an important result for comparative morphology.

Protoplanetary discs and ring structures constitute the sixth object. They are interesting because they combine a centre, disc, layers, rings, gaps, radial distribution of matter and the possible formation of new bodies. Morphologically, they belong to the family of centred-layered forms, but physically they are associated with gravity, angular momentum, accretion, dust, gas and planetary formation. For the Matrix hypothesis, they are valuable as examples of structures in which centre and periphery are organised through rotation and ring-shaped levels. They may be analysed through radial profiles, number of rings, gap width, symmetry, asymmetry, density distribution and the presence of spiral disturbances.

Planetary surfaces may constitute the seventh object. They are closer to the geological section, but within a cosmological context they reveal forms found upon other celestial bodies: craters, canyons, volcanic regions, fractures in ice, dunes, polar structures, bands, rings and faults. Planetary morphology extends geological analysis beyond the Earth. This is especially important for testing whether certain morphological features are common to solid bodies under different conditions. Crater radiality, fracture networks, layering, channel-like forms, ice faults and volcanic shields, for example, may be analysed using the same methods as terrestrial structures while accounting for environmental differences.

Cosmological data are especially valuable because they are frequently available through extensive image archives and catalogues. This makes it possible to construct a data corpus instead of selecting individual ‘beautiful’ nebulae or galaxies. A sample might include nebulae of a particular type, galaxies belonging to different morphological classes, supernova remnants, protoplanetary discs, planetary craters and clouds of gas and dust. Every object could then be

described through a common morphological record: centre, shell, layer, filament, spiral, edge, asymmetry, fractal complexity, radiality and brightness distribution. Such an approach would prevent the arbitrary selection of images.

Normalisation is especially important when working with cosmological data. Objects differ in size, distance, angular scale, resolution, observational depth and wavelength. Comparing absolute dimensions is therefore often meaningless. Dimensionless parameters must be used: the ratio of the radius of the central region to the total radius, number of arms, asymmetry coefficient, fractal dimension of the edge, normalised shell thickness, degree of brightness concentration, relative filament density and angular distribution. Such parameters make it possible to incorporate cosmic objects into a general comparative morphology.

The treatment of colour is no less important. In astronomical images, colour is frequently artificial or composited. It may represent different filters, chemical composition, temperature, wavelength or an artistic-scientific visualisation. Morphological analysis should therefore rely not upon the emotional impression produced by colour, but upon structural channels: intensity, gradients, contours, segmentation, brightness distributions and density maps. Colour may be used to distinguish structures, but far-reaching conclusions should not be based solely upon the visual beauty of an image. This is essential to the scientific validity of the entire hypothesis.

Cosmological images are also frequently projections of three-dimensional objects onto a plane. A nebula, galaxy, shell or cloud possesses a spatial structure, but the observer sees it in projection. This can create formal illusions. A circular shell, for example, may be the projection of a spherical structure; an elongated form may result from the viewing angle; and overlapping filaments may be a line-of-sight effect. Morphological analysis must therefore account for the limitations of projection. Ideally, it should employ supplementary spectral, kinematic and multiwavelength data, three-dimensional reconstructions and models of matter distribution. Without such information, conclusions must remain cautious.

The cosmological section is especially closely connected with the concept of scale. The book has repeatedly emphasised that similarity of form does not imply identity of scale. A flower and a nebula are physically incomparable. A leaf and a cosmic filament belong to different levels of reality. Morphological analysis, however, works with relationships rather than absolute dimensions. If a centre, radiality, layers, filaments or an active edge are present in both cases, these features may be described dimensionlessly. Cosmological data should enter the hypothesis in precisely this way: not as proof that ‘the world is identical at every level’, but as a means of testing the recurrence of structural relationships at the largest scales.

Several morphological families of cosmic forms may be distinguished:

- Centred-shell structures: planetary nebulae, shells, supernova remnants and ring systems.
- Spiral structures: spiral galaxies, vortical gaseous forms and spiral elements within discs.
- Filamentary structures: threads of gas and dust, cosmic networks and elongated regions of density.
- Spotted and clustered structures: star clusters, star-forming regions and distributions of dense cores.
- Layered-disc structures: protoplanetary discs, rings, shells and gaps.

Such a classification would make it possible to move from excessively general claims about ‘cosmic similarity’ to specific morphological types.

A distinct set of parameters may be proposed for each family. For centred-shell structures, these would include centredness, radius, shell thickness, number of layers, symmetry and edge activity. For spiral structures: number of arms, pitch angle, asymmetry, the relationship between centre and disc, and fragmentation of the arms. For filamentary structures: filament length, nodes, connectivity, network density and thickness distribution. For clustered structures: number of centres, distances between them, degree of clustering and density distribution. For disc structures: radial profiles, number of rings, gap width, symmetry and disturbances. Such a parametric approach would make the cosmological section scientifically manageable.

The comparison of cosmological data with numerical models possesses particular significance. Reaction–diffusion models may generate spots, rings, spirals and fronts. Fractal iterations may produce self-similar edges and branching structures. L-systems are less directly applicable to cosmic phenomena, but may serve as formal models of branching and filamentarity. A–B–C–D models may describe not an object's physical cycle, but the parameters of transition from a compact concentration to an extended structure or from a cloud to localised centres. Comparisons must remain cautious, but they may reveal which generative schemes produce forms that are morphometrically close to cosmic data.

The cosmological section also requires control groups. If only flower-like nebulae or galaxies with beautiful spirals are selected, the result will be biased. Random samples of cosmic objects of different types must be included, together with objects lacking pronounced centredness, radiality or shells. Author-selected triads must be compared with random sets. If, for example, a nebula is included in the triad 'flower—relief—nebula', it is necessary to test whether its parameters of radiality, layering and active edge genuinely make it more similar to the flower and relief than randomly selected nebulae. Only in this way can cosmological analogies become testable.

The visual illustration accompanying this section might present cosmological data as a separate analytical corpus (*Fig. 4*). It would be logical to depict several types of object: a nebula with a shell, a spiral galaxy, a filamentary cloud of gas and dust, a supernova remnant or ring structure, a protoplanetary disc and a map of matter distribution. The extracted features could be shown alongside them: centre, spiral, shell, filaments, active edge, layers and asymmetry. The illustration should be scientific rather than fantastical, avoiding mystical effects and excessive decoration while emphasising structural analysis.

Cosmological data are especially important to the philosophical level of the hypothesis because they extend the discussion of form to the scale of the Universe. For precisely this reason, they require maximum rigour. The more impressive the object, the greater the risk of poetic exaggeration. The book should avoid formulations such as 'the nebula proves the existence of a cosmic flower' or 'the galaxy repeats the form of a plant'. It is more accurate to state that certain cosmological objects exhibit morphological features comparable with those found at other levels: centredness, spirality, shell-like organisation, filamentarity, the active edge and scale-dependent complexity. These features may be measured and incorporated into comparative analysis.

Ultimately, cosmological data provide the Matrix hypothesis with its broadest, but not its simplest, scale of testing. They require knowledge of the nature of the images, consideration of projection effects, parameter normalisation, work with catalogues, sampling controls and cautious interpretation. Their value lies not in the production of striking visual analogies, but in their ability to raise the question of recurring morphological invariants within systems radically

different from biological and terrestrial ones. If certain features are indeed manifested consistently at the cosmic level, this will provide important material for further comparative morphology.

Thus, cosmological data—nebulae, galactic structures, clouds of gas and dust, supernova shells, protoplanetary discs, filamentary networks and maps of matter distribution—may be used to analyse centres, shells, layers, spirals, filaments, active edges, asymmetry and scale-dependent complexity. They do not directly prove the philosophical universality of the Matrix, but they provide material for testing its proposed morphological features at the largest scales. The cosmological section should therefore become an independent component of the BIO–GEO–COS corpus, with its own rules of selection, processing, annotation and interpretation.

24.5. Artificial Intelligence and Form Recognition

Artificial intelligence and computer vision may become some of the key instruments for the further testing of the hypothesis of the Unified Matrix of the Universe. The preceding sections of this chapter examined different sources of data: chemical reaction–diffusion systems, biological models, geological and geophysical materials, and cosmological images. All these fields provide an immense body of visual information. The human eye, however, is incapable of reliably and impartially processing thousands or millions of images, extracting identical features from them, comparing frequencies, constructing morphological clusters and separating stable regularities from subjective impressions. It is here that computer vision and machine-learning methods become fundamentally important.

The principal task of artificial intelligence within the framework of this hypothesis should not be to ‘prove the Matrix’, but to recognise, classify and compare morphological features in different types of images. AI should not replace philosophical interpretation. It should perform the technical work: identifying contours, centres, axes, symmetries, layers, branching structures, spirals, active edges, fractal-like structures, recurring elements, nodes, shells, radial profiles and other features identified in the preceding chapters. This will make it possible to test not subjective resemblance, but the recurrence of specific formal characteristics.

The first area in which computer vision may be applied is image segmentation. To analyse a form, it is necessary to separate the object from the background and identify its boundary, internal structures, regions of interest, lines, nodes, layers and areas of high and low density. In biological images, these may include the outline of a leaf, venation, petals, a seed, mycelium or a vascular network. In geological data, they may be river channels, faults, folds, coastlines, craters and relief zones. In cosmological data, they may include nebular shells, filaments, spiral arms, bright nuclei and regions of gas and dust clouds. Without high-quality segmentation, all subsequent measurements will be unreliable.

The second area is the automatic extraction of contours and active edges. The edge is one of the central concepts of this study, but it must be formalised if it is to be analysed scientifically. Computer vision can identify the boundaries of objects and measure their length, curvature, irregularity, local ruptures, waviness, fractal complexity and the sharpness of the transition between the internal and external regions. This is particularly useful for leaves, petals, coastlines, nebulae, chemical fronts, microbial colonies, mycelia, crack networks and crop circles. Automation will make it possible to analyse large samples rather than a single beautiful example.

The third area is the recognition of centres and axes. Many of the forms examined in this study are organised around a centre or along an axis: a flower, lotus, bud, crop circle, Sri Yantra, crater, nebula, spiral galaxy, leaf, tree or drainage basin. AI can search for the geometric centre, centre of mass, centre of radial symmetry, point of maximum density, compositional centre, principal axis, axis of symmetry or growth axis. This will make it possible to evaluate centredness and axial organisation quantitatively. It is particularly important that an algorithm can identify cases in which the centre is weak, displaced or multiple, meaning that the hypothesis will not artificially impose a centre upon every form.

The fourth area is symmetry analysis. Computer vision can evaluate radial, bilateral, rotational, axial and approximate symmetry. This may be achieved by comparing an image with rotated or mirrored versions of itself and measuring contour overlap, the distribution of elements across sectors, deviation from an ideal form and the degree of asymmetry. Such analysis is particularly important for flowers, lotuses, mandalas, the Sri Yantra, crop circles, craters, planetary shells, galaxies and nebulae. Symmetry must cease to be an impression and become a parameter.

The fifth area is the recognition of branching and network structures. Leaf veins, roots, trees, mycelia, vascular networks, river systems, cracks, faults, filaments of the cosmic medium and ornamental networks may all be represented as graphs. Computer vision can extract the skeleton of a structure, identify nodes, branch endpoints, intersections, principal and lateral lines, and measure segment lengths, branching angles, network density, branch order, connectivity and hierarchy. This is especially important for testing the axial-network type of the Matrix, which connects the leaf, valley, root system, river network and cosmic filaments at the level of morphological parameters.

The sixth area is the analysis of layering and nesting. Layers may appear as concentric rings, shells, rows of petals, geological strata, luminosity zones, levels of a mandala, recurring contours, ornamental bands, ring structures in chemical reactions or protoplanetary discs. Computer-vision algorithms can identify such levels through the analysis of contours, brightness, colour channels, gradients, distance from the centre, and the recurrence of lines and boundaries. This will make it possible to measure the number of layers, their thickness, regularity, radial distribution and relationship to the central region.

The seventh area is the recognition of spirals and rotational structures. Spiral forms occur in reaction–diffusion systems, shells, plant curls, galaxies, vortex structures, ornaments and certain crop-field diagrams. Computer vision can evaluate the presence of spiral arms, pitch angle, number of arms, spiral density, asymmetry, the relationship between the centre and the arms, and changes in width and brightness with increasing distance from the centre. Such analysis will make it possible not merely to speak of ‘spirality’, but to compare different spiral forms parametrically.

The eighth area is fractal and texture analysis. Algorithms can calculate the fractal dimension of a contour or network and analyse scale invariance, spectral characteristics, the distribution of spatial frequencies, textural heterogeneity and the density of fine elements. This is particularly useful for coastlines, nebulae, cloud structures, mycelia, microbial colonies, cracks, leaf edges, relief and complex ornaments. It is important to remember, however, that fractal dimension must be used cautiously and in conjunction with other features. AI can assist with calculations, but interpretation remains the responsibility of the researcher.

The ninth area is the classification of morphological types. Once features have been annotated and measured, models may be trained to distinguish between radial-layered, axial-network,

spiral, shell-like, fractal-edged, folded-opening, branching, concentric, labyrinthine, spotted and striped forms. Such classification may be either supervised, with the researcher defining the classes in advance, or unsupervised, with the algorithm independently searching for groups within the data. The second approach is particularly interesting: if the algorithm independently groups objects from different levels into a single cluster on the basis of morphological features, this will provide important material for discussing the hypothesis.

The tenth area is the search for morphological analogies within large corpora. For example, it would be possible to take an image of a leaf with a particular type of venation and search a database for geological, biological or cosmic objects with similar branching parameters. Alternatively, one might take a radial-layered nebula and search among flowers, craters, mandalas or crop circles for objects with a similar profile of centre, layers and edge. Such a search should be based not on visual similarity in the human sense, but on a feature vector. The analogies would then become reproducible: another researcher would be able to verify why the algorithm considers particular objects to be close.

For this purpose, each image may be assigned a morphological vector. Such a vector would include numerical features: degree of centredness, radiality and symmetry; number of layers; fractal dimension of the contour; degree of branching; node density; edge activity; presence of a spiral; compactness; asymmetry; the relationship between centre and periphery; and textural complexity. All objects in the BIO–GEO–COS database could then be positioned within a multidimensional feature space. Objects located close to one another in this space would be morphologically similar according to the measured parameters, even if they belonged to different levels of reality.

This approach would fundamentally alter the character of the hypothesis. Instead of the authorial assertion that ‘these forms are similar’, there would be a research procedure: ‘these forms occupy neighbouring regions of morphological space according to a specified set of features’. This does not automatically prove the philosophical Matrix, but it creates a more rigorous foundation for discussion. If flowers, nebulae, craters, mandalas and chemical rings cluster together according to the characteristics of their centres, layers and active edges, this can be discussed. If they do not cluster together, the visual analogy must be reconsidered.

AI can also assist in testing the author’s BIO–GEO–COS triads. For example, the research materials proposed the triad ‘flower — relief — nebula’. An algorithm could evaluate whether this triad genuinely possesses a shared morphological profile when compared with randomly assembled triads. This would involve calculating the features of each object and then determining the distance between them within feature space. If the author’s triad proves to be significantly closer than random triads, it receives quantitative support. If not, it remains an aesthetic or philosophical analogy, but not a strong morphometric example.

The possibility of blind testing is especially important. Images may be supplied to an algorithm without any indication of their semantic interpretation. It should not know that one object has been selected as a ‘flower’, another as a ‘cosmic shell’ and a third as an ‘artefact of the Matrix’. It should work solely with features. This reduces the risk of confirmation bias. If, after such blind processing, the objects still prove to be morphologically close, the result becomes considerably stronger. If the similarity disappears, this is also useful, because it helps distinguish convincing analogies from weak ones.

AI may also be useful in identifying negative cases. The hypothesis should not be constructed exclusively around correspondences. Computer vision can identify objects that do not conform

to the proposed types of the Matrix: forms without a centre, layers, branching or an active edge; forms with chaotic structures or a low degree of feature recurrence. Such objects are important for establishing the limits of the hypothesis. If a particular class of natural or cultural forms does not exhibit the expected features, this must be acknowledged. AI will help make such negative cases part of the analysis rather than excluding them from consideration.

Artificial intelligence may also be used to generate hypothetical forms, but particular caution is required here. Generative models are capable of producing images resembling flowers, nebulae, trees, fractals, mandalas or geological structures. Such images may be useful for visualising ideas, but they do not constitute experimental data. They cannot be used as evidence for the hypothesis. They may serve only as an auxiliary instrument: for creating illustrations, testing classifiers, modelling intermediate forms or constructing synthetic training datasets. Genuine conclusions must be based on real data, numerical models and controlled experiments.

When using AI, the problem of training data must also be considered. A form-recognition model will see only what it has been taught to see. If the training database is biased, the result will also be biased. For example, if the database contains many visually striking radial flowers but few irregular forms, the algorithm may overestimate radiality. If cosmological images have all been processed in a particular style, the model may recognise the processing style rather than the physical structure. If cultural ornaments are selected solely because they resemble the Matrix, the classification will be biased. The training corpus must therefore be diverse, balanced and thoroughly documented.

The problem of interpretability is also extremely important. If a neural network states that two objects are similar but cannot explain why, the result has limited scientific value. For this hypothesis, interpretable features are preferable: centre, axis, layers, branching, edge, fractal dimension, symmetry and spirality. Even if complex deep-learning models are used, their conclusions must be linked to intelligible morphological parameters. Otherwise, AI will become a ‘black box’ that merely replaces one form of subjectivity with another.

The optimal solution is therefore to combine two approaches. The first is feature-based: the researcher specifies morphological parameters in advance, and the algorithm measures them. The second is learning-based: the model independently searches for hidden regularities in the data. The first approach offers greater interpretability, while the second may uncover unexpected relationships. Ideally, they should test one another. If a neural network identifies a cluster of objects and feature-based analysis demonstrates that they are united by a centre, layers and an active edge, the result becomes convincing. If the neural network groups objects according to unclear or merely technical features, the conclusion must be qualified.

Artificial intelligence may also assist in constructing a morphological atlas. For every object in the database, it would be possible to generate an automatic record containing the original image, segmented form, extracted contour, centre, axes, branches, layers, edge parameters, fractal dimension, form class, degree of correspondence to a morphological type and its closest analogues at other levels. Such an atlas would be more than a visual album: it would become a practical research instrument. It would allow researchers to see quickly which features are present, which are absent, which objects are similar and where the boundaries of the hypothesis lie.

At a more advanced stage, a system for the automatic identification of morphological invariants could be constructed. It might analyse new images and produce an assessment such as: this object displays strong centredness, moderate radiality, three layers, a complex active edge, weak

branching and high asymmetry; it is close to the radial-layered type but differs from it in its high degree of edge complexity. Such a result is not a philosophical conclusion, but it provides material for the researcher. The author of the hypothesis or a group of specialists could then decide how the object should be interpreted and whether it should be included in the comparative analysis.

AI may also facilitate interdisciplinary communication. A biologist, geologist, astronomer, art historian and philosopher of form often work with different objects and different descriptive languages. A morphological classifier could provide a shared technical language: features, parameters, matrices, clusters, distances and graphs. This would not replace disciplinary expertise, but it would help connect different fields. A geologist, for example, could clarify the origin of a fault network; a biologist could explain the mechanism of leaf venation; and the algorithm could demonstrate that, in terms of their node and branching structures, these networks possess comparable parameters. The discussion would thereby become more precise.

The connection between AI and statistical testing is particularly significant. Computer vision can process large image corpora rapidly, but statistics must evaluate the significance of the results. An algorithm can extract features, construct clusters, calculate frequencies, compare authorial and random triads, and estimate distances between objects. Statistical analysis must then determine how robust these results are: whether they persist in other samples, under different methods of segmentation, with different model parameters and with independent annotation. AI without statistics may produce impressive but unreliable results. Statistics without automation may remain too limited in scale. Together, they constitute an essential instrumental framework.

Several stages may be proposed for practical implementation:

- the first stage — manual annotation of a small image corpus by experts;
- the second stage — training or configuring algorithms to extract basic features;
- the third stage — testing the algorithms on independent images;
- the fourth stage — expanding the BIO–GEO–COS database and adding the experimental EXP block;
- the fifth stage — constructing morphological vectors and clusters;
- the sixth stage — statistically testing the author's hypotheses;
- the seventh stage — creating an interactive atlas in which researchers can search for forms by features, levels, types and degree of correspondence to the Matrix.

It is also important to determine which images should not be used for rigorous testing. Heavily artistically processed cosmological images, decorative reconstructions, artificially generated pictures, stylised diagrams and illustrations may be useful for explanation, but they should not be mixed with primary data. The database must distinguish between real observational data, laboratory experimental data, numerically generated models, cultural artefacts and illustrative images. Each type of data must have its own status. AI should work with these annotations so that incomparable materials are not compared without their origins being specified.

Ethical and scientific transparency is equally important. If AI algorithms are used in the research, their type, version, parameters, training data, limitations, errors and validation methods must be specified. The result of neural-network classification must not be presented as absolute truth. An algorithm makes mistakes, depends upon its data, may amplify biases and sometimes extracts features other than those that appear important to a human observer. AI must therefore be regarded as an instrument rather than an authority. Its conclusions must be verified by experts and statistical analysis.

The visual illustration for this section might demonstrate the role of AI in form recognition (*Fig. 5*). It would be logical to present an analytical workflow: BIO, GEO, COS, CULT and EXP images enter a computer-vision system; segmentation then takes place, followed by the extraction of centres, axes, branching structures, layers, active edges, spirals and symmetry; a morphological vector is then generated; and finally, the objects are distributed into clusters and compared statistically. Such an illustration should not be a futuristic fantasy, but a restrained scientific diagram of data processing.

The principal point of this section is that the hypothesis of the Unified Matrix of the Universe can become testable only through a transition from individual perception to the systematic analysis of images. Artificial intelligence is capable of processing a scale of information inaccessible to a single researcher. It may detect recurrences that a human observer might overlook, while simultaneously identifying illusions of similarity that human observers are inclined to overestimate. To achieve this, however, AI must operate within a rigorous methodological framework: real data, consistent features, control samples, interpretable parameters, statistical testing and expert evaluation.

The conclusion may be formulated as follows. Experimental approaches to testing the hypothesis of the Matrix should include laboratory chemical reaction–diffusion systems, biological growth models, geological and geophysical data, cosmological images, and artificial-intelligence methods for form recognition. Each of these blocks has its own status and limitations. Chemical systems demonstrate the self-organisation of patterns within a controlled environment. Biology demonstrates living morphogenesis. Geology and geophysics demonstrate the forms of non-living terrestrial matter. Cosmology extends the analysis to the largest possible scales. AI connects these bodies of data within a unified comparative system.

Thus, artificial intelligence and computer vision do not complete the hypothesis, but provide it with a technical infrastructure. They make it possible to progress from individual visual analogies to image corpora, from subjective similarity to measurable features, and from the authorial selection of examples to statistically testable samples. For this reason, AI should be regarded as an essential instrument for the future comparative morphology of the Matrix. It does not answer the philosophical question concerning the meaning of the Matrix, but it helps determine whether stable morphological invariants exist that make this philosophical question scientifically discussable.

Fig. 1. Chemical Reaction–Diffusion Systems: Laboratory Formation of Spots, Stripes, Rings, Waves, Spirals, and Active Fronts in a Controlled Medium

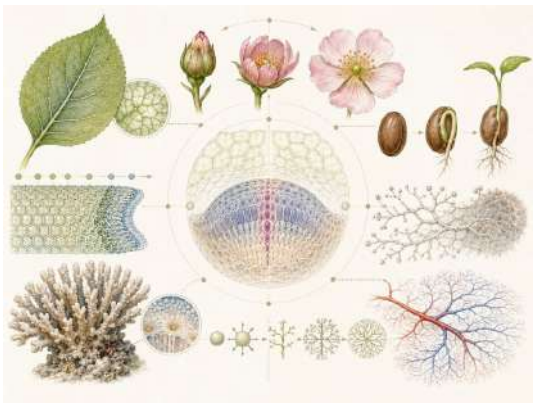

Fig. 2. Biological Models of Morphogenesis: Leaves, Flowers, Seeds, Tissues, Mycelial Networks, Corals, and Vascular Structures as Living Systems for Analysing Centre, Axis, Branching, Layers, Active Margins, and Unfolding

Fig. 3. Geological and Geophysical Data: Satellite Imagery, Digital Elevation Models, River Networks, Fault Maps, Folds, Craters, Coastlines, and Anomaly Fields as Material for Morphometric Analysis of Terrestrial Forms

Fig. 4. Cosmological Data: Nebulae, Galactic Spirals, Gas-and-Dust Clouds, Supernova Remnants, Protoplanetary Discs, and Filamentary Structures as Material for Analysing Centres, Layers, Spirals, Shells, Active Margins, and Scale-Dependent Complexity

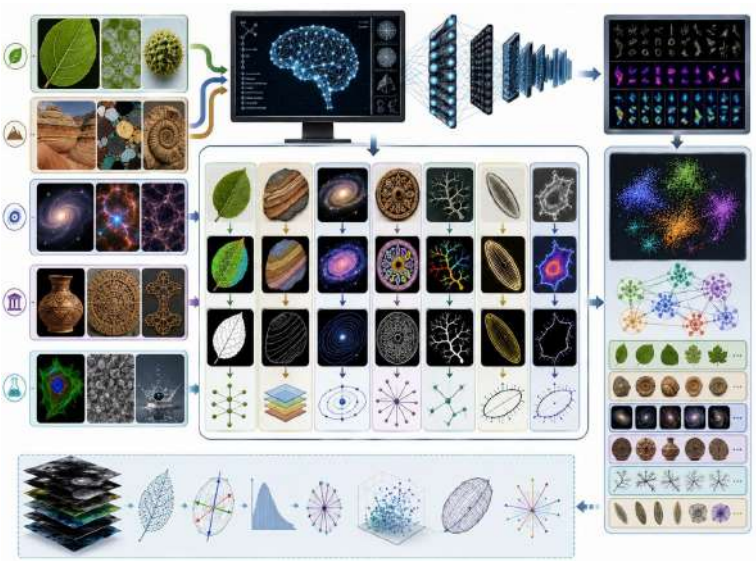

Fig. 5. Artificial Intelligence and Shape Recognition: Computer Vision, Segmentation, Detection of Centres, Axes, Layers, Branching, and Active Margins, Morphological Vectors, and Classification of BIO–GEO–COS–CULT–EXP Objects

Part Eight

Discussion, Limitations and Prospects

Chapter Twenty-Five

Strengths of the Hypothesis

25.1. Interdisciplinarity

One of the strengths of the hypothesis of the Unified Matrix of the Universe is its interdisciplinary character. The preceding chapters have demonstrated that the discussion of form cannot be confined to a single scientific field. Biology studies growth, tissues, leaves, seeds, flowers, vascular networks, mycelia and corals. Geology and geophysics analyse relief, faults, folds, river networks, coastlines, craters and fields of anomalies. Cosmology works with nebulae, galaxies, gas and dust clouds, supernova remnants and the large-scale structures of the Universe. Cultural studies, archaeology and art history examine artefacts, ornaments, sacred diagrams and symbols of the tree, lotus, circle, spiral and axis. Philosophy, in turn, raises the question of why different forms in the world may be understood as manifestations of recurring structural principles.

For this reason, the present hypothesis is not a narrowly specialised biological, geological, astronomical or cultural theory. It is situated at the intersection of several fields of knowledge and attempts to create a common language for describing form. This makes it both complex and promising. It is complex because every field possesses its own methods, concepts, standards of evidence and limitations. It is promising because many contemporary scientific problems can no longer be resolved within a single discipline. The study of complex systems, self-organisation, morphogenesis, fractality, pattern formation and visual structures requires movement between levels, scales and types of data.

The interdisciplinary character of the hypothesis is manifested primarily in the way it connects different classes of objects through morphological features rather than by asserting that they have the same origin. This is fundamentally important. A leaf, a river network and a cosmic filamentary structure do not possess the same physical mechanism of formation. A flower, crater and nebula are not literal variants of a single form. A sacred diagram and a biological organism belong to different ontological and cultural levels. They may all, however, be described through particular relationships: centre, axis, branching, layer, shell, active edge, symmetry, asymmetry, opening, self-similarity and the transition from the closed to the manifested. It is at this level that the hypothesis creates a space for interdisciplinary dialogue.

The strength of such an approach lies in the fact that it does not require different sciences to be artificially reduced to a single discipline. Biology remains biology, geology remains geology, cosmology remains cosmology, and cultural studies remain cultural studies. The hypothesis of the Matrix should not replace genetics, tectonics, astrophysics, archaeology or the history of religions. It proposes an additional level of analysis—the comparative morphology of forms. This level does not invalidate disciplinary explanations, but is superimposed upon them as a shared analytical layer. It makes it possible to ask whether stable structural invariants exist that manifest themselves in different systems governed by different mechanisms.

This question is particularly close to complex-systems theory. Contemporary thought concerning complex systems proceeds from the premise that order may arise not only through external design, but also through self-organisation, interactions among local elements, nonlinear dynamics, feedback, environmental constraints and the repetition of simple rules. From this perspective, similar forms may appear in different fields not because they have a single source, but because different systems sometimes arrive at comparable stable modes of organisation. Spots, stripes, spirals, branching structures, networks, layers and active edges may arise through different processes while retaining comparable morphological features.

The hypothesis of the Unified Matrix of the Universe is strong in its attempt to connect this language of complex systems with visual and philosophical morphology. It is neither restricted to mathematical models nor confined entirely to the realm of images. On the one hand, it draws upon reaction–diffusion systems, L-systems, fractal iterations, morphometry, statistics, computer vision and numerical modelling. On the other hand, it does not exclude cultural and philosophical images: the World Tree, lotus, seed, circle, mandala, artefact and sacred geometry. Its interdisciplinary strength lies precisely in its attempt to maintain both poles—the rigorous analysis of form and the semantic richness of form.

In this respect, the hypothesis may be regarded as a bridge between the natural sciences and the humanities. The natural sciences provide material concerning processes of form generation: growth, diffusion, erosion, gravity, pressure, flow, branching, folding and self-organisation. The humanities demonstrate how humans perceive, record, symbolise and culturally reinterpret forms. Philosophy makes it possible to raise the question of the relationship between observable form, regularity, image and meaning. In conventional scientific practice, these fields are often separated. In this book, they are united around the concept of the morphogenetic invariant.

Of particular value is the hypothesis's proposal that cultural forms should be regarded not as arbitrary decorations, but as possible records of humanity's experience of observing the natural structural organisation of the world. An ornament, artefact, Tree of Life, lotus, circle, spiral, star, mandala or Sri Yantra should not immediately be declared 'proof' of the Matrix. They may, however, be studied as cultural models of form. For thousands of years, humans have observed plant growth, natural cycles, the movement of celestial bodies, water, fire, clouds, animals, the body, birth and death. Some persistent cultural images may have arisen because particular forms possess a high degree of morphological and symbolic expressiveness. The hypothesis makes it possible to investigate this question systematically.

Interdisciplinarity is also manifested in the possibility of constructing a shared database of images and other data. The preceding chapters proposed the creation of a BIO–GEO–COS–CULT–EXP corpus in which biological, geological, cosmological, cultural and experimental objects would be described through a standardised morphological profile. Such a corpus could become a practical expression of interdisciplinarity. It would make it possible not merely to discuss similarities between forms, but to compare them through shared parameters: centre, axis, layer, contour, branching, fractality, symmetry, active edge, degree of opening, number of nodes, radiality and asymmetry. Different disciplines would thereby acquire a common descriptive language without losing their own specificity.

It is important to emphasise that interdisciplinarity does not mean the arbitrary mixing of terminology. This is one of the principal methodological dangers. Biological concepts cannot be transferred mechanically to cosmology, nor can the concepts of cultural studies be applied mechanically to geophysics. One cannot speak of a galaxy's 'growth' in the same sense as the

growth of a plant unless the metaphorical level has been clarified. An ornament cannot be treated as a geological process, nor a river network as a living organism. Interdisciplinarity requires linguistic discipline. For this reason, the book consistently distinguishes between mechanism, morphology and interpretation.

A strong interdisciplinary hypothesis must be capable of preserving boundaries. In the present case, those boundaries are as follows: mechanisms remain within their respective sciences; morphological features may be compared across sciences; and philosophical generalisation is constructed only after description and analysis. This makes it possible to avoid pseudoscientific universalism, in which everything is declared to be one and the same. On the contrary, the hypothesis of the Matrix should demonstrate that the world is diverse in its mechanisms but may be comparable in certain structural principles. Such a position is more cautious, but scientifically far stronger.

The interdisciplinary character of the hypothesis also opens the way for collective research. No single author or discipline can test all its propositions comprehensively. Work with biological models requires botanists, morphologists, biophysicists and specialists in tissues and development. Geological data require geomorphologists, geologists, geophysicists and remote-sensing specialists. Cosmological images require astronomers and astrophysicists. Cultural forms require archaeologists, art historians, scholars of religion and cultural theorists. Formalisation requires mathematicians, programmers and specialists in computer vision and statistics. By its very nature, such a hypothesis requires a research network.

This is also one of its strengths. The hypothesis does not depend upon a single proof or discipline. It may develop gradually through the refinement of concepts, the creation of databases, the testing of particular features, experimental series, numerical models, criticism of weak analogies and the expansion of strong ones. In this sense, it resembles a research programme more closely than a completed theory. A strong hypothesis does not have to provide final answers immediately. It should generate new questions, methods and testable lines of inquiry. Interdisciplinarity keeps such a programme alive.

Another strength is that the hypothesis combines visual and analytical thinking. Many scientific fields work with images: microscopy, satellite imaging, astrophotography, cartography, medical imaging, archaeological documentation and computer modelling. These images, however, frequently remain confined within their respective disciplines. The hypothesis of the Matrix proposes that the image should be treated as a carrier of morphological information suitable for comparison across different levels. This is particularly important in the age of large-scale visual data. The scientific world is increasingly becoming a world of images, maps, photographs, models and visualisations. A language for their comparative analysis is therefore required.

Such a language may prove useful not only for the present hypothesis, but also more broadly for the philosophy of form, visual epistemology, modelling theory, systems biology, geomorphology, cultural analytics and the digital humanities. If a rigorous set of morphological features and methods for comparing them can be created, it may be applied to different tasks: the classification of natural patterns, the analysis of ornaments, the comparison of biological and geological networks, the study of visual archetypes, the construction of educational materials and the development of scientific visualisation. The interdisciplinary character of the hypothesis therefore has not only philosophical but also practical significance.

The pedagogical strength of this interdisciplinarity should also be noted. The idea of form passing through different levels of the world is readily understood by readers because it connects familiar

images: leaf, tree, flower, stone, river, nebula, ornament, star, circle and spiral. These images may be used to explain complex scientific concepts: self-organisation, fractality, symmetry, morphogenesis, pattern, gradient, branching, scale and parametric space. The book may become not only an exposition of the hypothesis, but also a means of teaching readers to perceive the structure of the world more attentively. This is an important humanistic value of the project.

Pedagogical accessibility must not, however, replace scientific rigour. The more convincing the visual parallels appear, the more cautiously they must be interpreted. Interdisciplinarity is strong only when it does not become a collection of beautiful coincidences. Every analogy must therefore be subjected to the question: what exactly is being compared? The contour? Centre? Branching? Layer? Dynamics of opening? Fractal dimension? Active edge? If this question cannot be answered, the analogy remains artistic. If it can be answered and the relevant parameter can be measured, the analogy becomes scientifically discussable.

The interdisciplinary character of the hypothesis of the Unified Matrix of the Universe should therefore be understood as its principal methodological opportunity. It makes it possible to perceive form as a shared field of research in which biology, geology, cosmology, cultural studies, philosophy and complex-systems theory meet. It does not eliminate the differences between these fields, but creates an analytical bridge between them. The strength of the hypothesis lies not in the assertion that everything in the world is identical, but in the proposition that different levels of the world may demonstrate recurring morphological invariants that can be described, compared, formalised and tested.

Thus, interdisciplinarity is one of the key strengths of the hypothesis because it makes it possible to unite data concerning living nature, terrestrial structures, cosmic objects, cultural forms and computational models within a single language of morphology. This interdisciplinarity must be cautious, methodologically rigorous and open to criticism. It should not conflate the mechanisms studied by different sciences, but it may compare the structural features of form. In this capacity, the hypothesis of the Unified Matrix of the Universe has the potential to become not only a philosophical idea, but also a broad research programme.

25.2. Visual Persuasiveness

The second strength of the hypothesis of the Unified Matrix of the Universe is its visual persuasiveness. This characteristic immediately distinguishes it from many abstract philosophical constructions. The hypothesis addresses not only concepts, but also visible forms: the leaf, flower, seed, tree, root, mycelium, coral, river network, geological fold, crater, nebula, galactic spiral, artefact, ornament, mandala, Sri Yantra and crop circle. The reader does not merely encounter an argument concerning possible structural invariants, but sees material that genuinely evokes a sense of morphological affinity between different levels of the world.

This visual persuasiveness is highly significant for the perception of the hypothesis. Form often acts more rapidly than a concept. When a person sees leaf venation, a river network and a cosmic filamentary structure placed alongside one another, the shared logic of branching becomes intuitively apparent. When a bud, a stone with an internal structure and a planetary shell are compared, the themes of hidden form, enclosure and internal tension become visible. When a flower, relief and nebula are placed together, they evoke a sense of radiality, layering and an

active edge. Images are therefore not an additional embellishment to the study, but one of its principal means of posing the research question.

The visual power of the hypothesis is connected with the profound sensitivity of human perception to the structures of form. We recognise symmetry, repetition, centre, edge, rhythm, contour, movement, branching, spirals, layers and disturbances of equilibrium even before we begin to describe them in words. The human visual system can identify patterns, group elements, recognise similarities and differences, and perceive the composition of the whole. Morphological parallels between objects belonging to different levels can therefore be perceived directly. The hypothesis uses this perceptual ability as its point of departure.

Visual persuasiveness must not, however, be confused with evidential force. This is a fundamentally important limitation. The resemblance of two forms does not mean that they possess a common mechanism of origin. The fact that a nebula resembles a flower does not mean that it is a cosmic flower. The fact that a river network resembles leaf venation does not mean that a river grows like a leaf. The fact that an ornament resembles a biological structure does not mean that an ancient craftsperson possessed scientific knowledge of morphogenesis. Visual similarity opens a question, but does not resolve it. It invites analysis, but does not replace analysis.

It is precisely here that the mature position of the hypothesis becomes apparent. Its strength does not lie in presenting images and declaring: 'Look, everything is the same.' Such a position would be weak and methodologically vulnerable. The strength of the hypothesis lies elsewhere: it demonstrates that visual parallels are sufficiently stable and expressive that they cannot simply be dismissed as an accidental play of the imagination. At the same time, it requires these parallels to be translated into a language of features. What exactly is similar? The centre? Axis? Layers? Branching? Edge? Fractal complexity? Radiality? Spirality? Sequence of opening? Only after this clarification does visual persuasiveness become the beginning of a scientific procedure.

Visual material is especially important because it helps the hypothesis to be perceived as a whole. If the Matrix is described solely in words, it may appear excessively abstract. If the discussion is confined to morphometry, fractal dimension and statistical parameters, the imaginative energy of the idea is lost. Images make it possible to retain both levels: they present the complete form and subsequently direct attention towards measurable features. The reader first perceives the similarity and then learns to analyse it. This progression corresponds to the natural logic of cognition: from observation to description, from description to classification, and from classification to testing.

The visual persuasiveness of the hypothesis is also evident in the universal recognisability of many of the forms under consideration. The flower, tree, leaf, circle, spiral, star, wave, river, mountain, shell and seed are images present in the experience of almost every person. They require no specialist knowledge for their initial perception. At the same time, they conceal profound morphological complexity. A leaf may be an object of botany, geometry, graph theory, fractal analysis and the philosophy of form. A river may be an object of hydrology, geomorphology and comparative network morphology. A flower may be a biological structure, a cultural symbol and a model of opening. The combination of perceptual simplicity and analytical depth constitutes a significant strength of the study.

The BIO–GEO–COS visual triads play a particular role. They make it possible to demonstrate not an isolated similarity, but a recurring type of comparison. A biological, terrestrial and cosmic form

may, for example, be placed alongside one another not in order to declare them identical, but to identify a shared morphological profile. One triad may be dominated by radiality and layering; another by axis and branching; a third by enclosure and hidden tension; and a fourth by an active edge and fractal periphery. This method of presentation makes the hypothesis both visually accessible and structurally organised.

Importantly, visual triads function as a methodological instrument. They discipline observation. A single object may be beautiful and impressive, but a triad demands comparison. When three objects belonging to different levels are placed alongside one another, it becomes necessary to explain which features unite them and which distinguish them. This is not merely an illustration, but a form of comparative analysis. A well-constructed triad should demonstrate not only similarity, but also its boundaries. A leaf and a river network, for example, may have similar branching, but the leaf possesses a biological blade, while the river network has a drainage basin. A flower and a nebula may exhibit radiality, but their mechanisms of formation differ radically. It is precisely this duality that makes the visual method scientifically useful.

Visual persuasiveness is strengthened when images are accompanied by consistent terminology. If the concepts of centre, axis, active edge, layer, shell, opening, branching and self-similarity recur throughout every chapter, the reader begins to perceive a system rather than a chaotic collection of images. The illustrations cease to be isolated beautiful pictures and become elements of a morphological language. This is particularly important for the study because it seeks to propose not only a hypothesis, but also a new way of describing form. Visuality serves here not as decoration, but as a structuring principle of the exposition.

At the same time, visual persuasiveness carries its own danger. Human perception is inclined to identify images even where none exist. We may see faces in clouds, figures in stones, animals in nebulae and symbols in random lines. This ability is not only a power of the imagination, but also a source of cognitive error. The hypothesis of the Matrix must therefore continually protect itself from visual arbitrariness. To achieve this, morphological similarity must be distinguished from pareidolia. Pareidolia perceives the image as a whole: ‘this resembles a flower’, ‘this resembles an eye’ or ‘this resembles a tree’. Morphological analysis asks which features of the forms coincide, how they may be measured, how stable they are and whether control examples exist.

Visual persuasiveness must therefore be combined with visual discipline. Every illustration should be selected not only for the strength of its impression, but also for its analytical value. Excessively artistic, artificially processed or coincidentally striking images should be avoided if they provide no measurable material. Particular caution is required when working with cosmic images, cultural artefacts and crop circles, because their visual effect may be extremely powerful while their interpretation is especially hazardous. The more beautiful the analogy, the more rigorously its testability must be questioned.

A strength of the study is its ability to transform visual persuasiveness into a research resource. An image becomes the first level of the hypothesis. It raises a question. A morphological profile then records its features. Morphometry measures its parameters. Fractal analysis tests its scale-dependent complexity. Numerical modelling demonstrates possible generative rules. Statistics compare the author’s triads with random ones. Computer vision processes large image corpora. Within this sequence, visuality is not eliminated, but progresses from intuition towards testing.

Visual persuasiveness also helps preserve the connection between the scientific and philosophical dimensions of the project. Scientific analysis requires parameters, graphs, models and statistics. The philosophical hypothesis of the Matrix, however, addresses a broader

experience of form. Human beings do not perceive the world solely through tables. They see flowers, rivers, the sky, stones, trees, stars and ornaments. If the book seeks to discuss the form of the Universe, it cannot abandon visual experience. Visuality makes it possible to preserve the wholeness of perception even as the analysis becomes more rigorous.

Images also create a space for intercultural understanding. Terms may be complex, disciplinary and subject to losses in translation. Form, however, is often perceived directly. The lotus, tree, spiral, circle, star, wave, branch and shell are visual structures that can be understood beyond the boundaries of a narrow scientific school. The visual dimension of the hypothesis may therefore be especially important for dialogue among science, philosophy, art, culture and education. It makes a complex idea accessible without reducing it to a primitive scheme.

Visual persuasiveness may also provide a pedagogical advantage. Images can be used to explain concepts that are difficult to understand in purely theoretical form: morphogenesis, self-organisation, fractality, active edge, centre–periphery structure, structural invariant, parametric space and the A–B–C–D model. A single image of an opening bud, for example, may demonstrate the transition from a closed form to a multilayered structure more effectively than several pages of abstract description. Text is nevertheless necessary to explain where the image ends and the scientific model begins.

It is also important that the visual persuasiveness of the hypothesis can be tested through independent perception. Experiments may be conducted with both experts and non-specialists: images can be shown without labels, participants can be asked to group them according to similarity and identify relevant features, and the results of human classification can then be compared with algorithmic classification. If different observers independently identify the same morphological groups, this will provide an additional argument for the stability of the visual invariants. If the results differ greatly, it will demonstrate that some analogies depend upon the author's interpretation. In either case, visual persuasiveness becomes a subject of research rather than merely an impression.

In this sense, it is possible to speak of the visual testability of the hypothesis. This differs from rigorous physical testability, but it is not arbitrary. Visual testability means that the features of a form can be presented, described, annotated, measured and compared. If an object is claimed to possess a radial-layered structure, this claim can be tested. If branching is identified, a graph can be constructed. If an active edge is identified, its curvature and complexity can be measured. If a triad is said to be similar, its morphological vectors can be compared. Visuality thereby becomes an entry point into formalisation.

The strong visual dimension of the hypothesis is particularly important for its future development. If an atlas of the forms of the Matrix is created, it could become not merely a supplement to the book, but an independent research instrument. Such an atlas might include biological, geological, cosmological, cultural and experimental images accompanied by morphological profiles. The reader or researcher would see not only an image, but also a set of features: centre, axis, layers, branches, contour, edge, symmetry, scale, fractality and A–B–C–D stage. This would transform visual persuasiveness into systematic knowledge.

It must nevertheless be acknowledged that visual persuasiveness may become a weakness if it is overused. A beautiful selection of images can create an illusion of proof. This is especially dangerous in visually spectacular fields such as the cosmos, sacred geometry, ancient artefacts and unusual natural structures. A strong version of the hypothesis must therefore impose limits

upon its own visual rhetoric. It must state: ‘This appears similar, but we must determine which features genuinely coincide.’ Such self-restraint increases confidence in the book.

Visual persuasiveness is therefore a strength of the hypothesis only when combined with methodological honesty. If the author acknowledges the differences between mechanisms, identifies the limits of interpretation, proposes measurable features and allows for negative results, the images reinforce the scientific strength of the text. If images are instead used to exert emotional pressure upon the reader, they weaken the hypothesis. The visual strategy of the study should therefore not constitute persuasive advocacy, but a consistent demonstration of the research question.

The visual persuasiveness of the hypothesis consequently has a dual nature. On the one hand, it provides the book with a powerful point of entry: the reader can see that the morphological parallels are genuinely noticeable. On the other hand, it requires rigorous testing because visual similarity is easily overestimated. The productivity of the hypothesis emerges precisely within this tension between immediate perception and analytical discipline. It begins with wonder at the similarity of forms, but must conclude not with wonder, but with research.

Thus, visual persuasiveness is an important strength of the hypothesis of the Unified Matrix of the Universe because morphological parallels among biological, geological, cosmological, cultural and experimental objects are genuinely visible and are readily perceived through images. This persuasiveness, however, does not constitute independent proof. Its value lies in opening a research question, helping to establish a morphological language and directing attention towards measurable features. When visual intuition is combined with morphometry, fractal analysis, numerical modelling, statistics and computer vision, it becomes not a weakness, but one of the hypothesis’s principal resources.

25.3. The Possibility of Formalisation

The third strength of the hypothesis of the Unified Matrix of the Universe is the possibility of its formalisation. This is particularly important because any broad philosophical and morphological hypothesis risks remaining merely a beautiful idea if it offers no means of testing, measuring and refining its claims. Visual parallels among leaves, rivers, nebulae, artefacts, flowers, folds, circles and spirals may be impressive, but they do not in themselves constitute a scientific programme. A hypothesis becomes strong when its principal propositions can be translated into a language of features, parameters, models, classifications, comparisons and statistical procedures.

The possibility of formalisation means that the hypothesis is not confined to metaphor. Images such as the ‘circle-seed’, ‘World Tree’, ‘opening bud’, ‘active edge’, ‘morphogenetic axis’ and ‘structural invariant’ may be philosophically expressive, but they must acquire operational content if they are to be analysed scientifically. If a centre is discussed, for example, it is necessary to specify which centre is meant: geometric, compositional, energetic, density-based, developmental, symmetrical or functional. If a layer is discussed, it must be determined how that layer is distinguished: by contour, brightness, density, boundary, colour, height, structure or recurrence. If an active edge is discussed, it must be demonstrated which parameters make the edge active: curvature, irregularity, gradient, growth, front, fractal complexity or interaction with the environment.

Formalisation therefore begins with a morphological vocabulary. What has not been defined cannot be measured. The preceding chapters gradually identified the principal concepts: centre, axis, branching, layer, shell, contour, active edge, symmetry, asymmetry, radiality, spirality, fractality, fold, opening, potentiality, manifestation and A–B–C–D. These concepts must now be translated into a system of features. Every feature must have a description, a method for extracting it from an image, possible numerical indicators, an area of applicability and clearly stated limitations. The hypothesis would thereby acquire its first level of scientific rigour.

Morphometry is one of the principal instruments of such formalisation. It makes it possible to measure form rather than merely describe it in words. For any object, it is possible to determine dimensions, proportions, compactness, area, perimeter, edge curvature, degree of radiality, symmetry, asymmetry, position of the centre, number of layers, branching angles, number of nodes, network density and the relationship between central and peripheral zones. These parameters may be applied to biological, geological, cosmological, cultural and experimental images, provided that an appropriate protocol is established for each type of data. Morphometry transforms a visual analogy into a measurable comparison.

A leaf, river network and vascular structure, for example, may be compared not because they ‘look alike’, but because it is possible to measure their branching order, distribution of segment lengths, branching angles, node density, relationship between the principal axis and lateral lines, and fractal dimension of the network. A flower, crater and nebula may be compared according to degree of centredness, number of layers, radial profile, edge asymmetry and the distribution of brightness or height from the centre towards the periphery. An ornament, mandala and crop circle may be analysed through symmetry, recurrence of elements, nesting of levels, peripheral activity and structural hierarchy. In every case, the analysis concerns a set of features rather than an arbitrary resemblance.

Fractal analysis constitutes a second important direction of formalisation. Many of the forms discussed in the book possess scale-dependent complexity: tree branches, roots, leaf veins, mycelia, vascular networks, coastlines, cracks, drainage basins, cosmic filaments, nebulae and ornamental edges. Fractal dimension, the analysis of scale invariance, box-counting, and the assessment of contour and network complexity make it possible to describe quantitatively what the eye perceives as a ‘complex edge’ or ‘self-similar branching’. This is particularly important to the hypothesis of the Matrix because self-similarity is one of its key features.

Fractal analysis must nevertheless be used cautiously. Not every complex form is a strict mathematical fractal. Many natural forms are fractal-like only across a limited range of scales. Certain cultural forms employ repetition and nesting without possessing a fractal structure in the strict sense. Formalisation must therefore distinguish among a mathematical fractal, natural scale-dependent complexity and cultural fractal-like organisation. The word ‘fractal’ must not become a universal metaphor. Its strength lies precisely in the fact that it can be measured and tested.

The third direction of formalisation is graph analysis. This is especially important for all networked and branching structures. If an object can be represented as a system of nodes and connections, it can be analysed using graph theory. This applies to leaf veins, river networks, roots, mycelia, vascular structures, cracks, faults, filamentary structures and ornamental networks. Graph analysis makes it possible to measure the number and degree of nodes, edge lengths, branch hierarchy, connectivity, network density, centrality, cycles and branching distribution. It provides a rigorous language for comparing axial-network forms.

This approach is particularly important because it helps prevent superficial analogies. Two networks may appear similar while possessing different topologies. A river network, for example, generally has a tree-like direction of drainage, whereas a vascular or fungal network may contain additional connections and loops. Leaf venation may be reticulate, pinnate or parallel. A cosmic filamentary structure may possess nodes and voids of a completely different kind. Graph analysis makes it possible to identify not only similarities, but also differences. This increases the precision of the hypothesis.

The fourth direction is the analysis of symmetry and asymmetry. Symmetry is often perceived visually, but it can also be measured. Mirror, radial and rotational symmetry may be evaluated alongside the degree of deviation from an ideal centre, sector irregularity, displacement of the centre, variability of radii and edge asymmetry. This is important for flowers, lotuses, mandalas, the Sri Yantra, craters, galaxies, nebulae, biological tissues and cultural ornaments. The formalisation of symmetry makes it possible to demonstrate where a form is genuinely organised around a centre and where centredness is merely a visual illusion.

The fifth direction is the analysis of opening. The A–B–C–D model occupies a particular place in the book because it describes the transition from a closed form to an opened structure and subsequently to a new potentiality. For this scheme to become testable, numerical parameters must be defined: closure, degree of opening, visible area, number of layers, opening angle, edge activity, internal tension, emergence of an axis, appearance of new centres and rate of transition. The opening of a flower, germination of a seed, rupture of a shell, unfolding of an artefactual composition or development of a numerical model could then be compared as trajectories of parameters.

Such a representation is especially valuable because it moves the hypothesis from the static into the dynamic domain. The comparison encompasses not only completed forms, but also processes of change. A bud and flower, for example, may be regarded as different states of the same form. A seed and seedling may be regarded as successive stages. A chemical front and the resulting pattern may be regarded as different moments of self-organisation. A fault and a fault network may be regarded as the development of stress and rupture. If time series can be constructed for these processes, the hypothesis acquires dynamic formalisation.

The sixth direction is numerical modelling. Chapter 23 examined reaction–diffusion models, L-systems, fractal iterations, models of folding and opening, and the parametric A–B–C–D model. All of these are important because they make it possible not only to measure existing forms, but also to generate forms according to specified rules. If a model with a small set of parameters creates a structure that is morphometrically close to a real object, this supports the proposition that the relevant class of forms may result from a particular generative principle. If the model fails to reproduce the real form, this is also a useful result because it demonstrates the limits of the analogy.

Numerical modelling is particularly important for testing the idea of the Matrix as a space of possible forms. If the Matrix is understood not as a single design, but as a set of generative relationships, the models must demonstrate which forms arise as the parameters change. A reaction–diffusion system may transition from spots to stripes and spirals. An L-system may generate different trees and leaves when its branching angles and reduction coefficients are altered. A fractal iteration may create different types of edges and self-similar structures. A folding model may move from a closed shell to an opened multilayered form. This makes it possible to represent the Matrix as a parametric space of morphogenesis.

The seventh direction is statistical testing. Even when features have been defined and measured, it remains necessary to determine whether the correspondences are significant. This requires comparing the author's selections with random samples, constructing control groups, testing the stability of clusters, evaluating differences between morphological classes, measuring effect sizes and estimating the probability of chance correspondences. Statistics are particularly important because the human eye tends to select the most expressive examples. Without controls, the hypothesis may prove to be based upon a selection of especially successful illustrations. Formalisation reduces this risk.

Statistical testing may be organised along several lines. The first is the testing of individual features: how frequently radial-layered structures occur in different types of objects. The second is the testing of feature combinations, such as centre + layers + active edge. The third is the testing of the author's BIO–GEO–COS triads: whether the selected objects are genuinely closer to one another in morphological vector space than randomly constructed triads. The fourth is cluster analysis: whether objects from different levels group together according to structural features. The fifth is the testing of negative cases: where the hypothesis does not work or works only weakly.

The eighth direction is computer vision and artificial intelligence. These technologies make it possible to automate feature extraction and work with large image corpora. Whereas dozens or hundreds of objects may be analysed manually, thousands or tens of thousands can be analysed algorithmically. This is particularly important for geological data, cosmological archives, biological images and cultural collections. Computer vision can identify contours, centres, axes, layers, branches, edges, spirals, symmetries and textures. Artificial intelligence can classify objects, construct morphological clusters, discover unexpected analogies and reveal weaknesses in the author's interpretation.

Formalisation through AI is particularly valuable because it may reduce dependence upon the author's perspective. If an algorithm operates according to predefined features and is applied to large samples, it can demonstrate where visual analogies are genuinely robust and where they depend upon subjective selection. AI, however, is not a neutral absolute. It depends upon the data, parameters, annotation methods and quality of the algorithm. Formalisation must therefore include transparency: which data were used, how they were processed, which features were extracted, how errors were tested and who conducted the expert evaluation.

The possibility of formalisation also entails the possibility of criticism. This is an extremely important point. Weak hypotheses often avoid testing because testing may reveal their limitations. Strong hypotheses, by contrast, benefit from formalisation because it gives them an opportunity to be refined. If morphometric analysis demonstrates that some proposed analogies are weak, they can be excluded. If fractal dimension does not support a similarity, the conclusion must be reconsidered. If the author's triad does not differ from a random triad, it cannot be used as a strong argument. Such openness to testing makes the hypothesis scientifically mature.

Formalisation also helps distinguish among different levels of claims. A philosophical claim that the world may be understood through invariants of form is one thing. An empirical claim that a particular type of branching occurs more frequently than expected by chance in biological and geological networks is another. A mathematical claim that a model with specified parameters reproduces a particular morphological profile is a third. A cultural claim that a particular symbol records a visual scheme of opening is a fourth. These levels must not be conflated. Formalisation helps keep them separate.

An important result of formalisation may be the morphological profile of an object. Such a profile should include a description of the image source, scale, object type, extracted features, numerical parameters, form class, degree of correspondence to the A–B–C–D model, the presence of a centre, axis, layers, branching, active edge, fractal complexity, symmetry and asymmetry, as well as the limitations of interpretation. If every object in the study is described in this manner, the hypothesis will acquire not only a textual, but also an empirical research foundation. The morphological profile transforms an image into data.

A comparative matrix may be created from these profiles. Its rows would contain objects: leaves, flowers, seeds, mycelia, river networks, craters, nebulae, galaxies, ornaments and chemical patterns. Its columns would contain features: centre, axis, branching, layer, edge, fractality, radiality, spirality, symmetry and opening. The values might be binary, categorical or quantitative. Such a table would make it possible to identify which features unite different objects, which occur rarely and which form stable combinations. This would no longer be a philosophical metaphor, but an analytical structure.

A morphological space could then be constructed. Every object would receive coordinates based upon its set of features. Similar objects would be positioned near one another, while dissimilar ones would occupy different regions. It would then be possible to determine whether biological, geological, cosmological and cultural forms create overlapping regions or remain entirely separate. The presence of clusters could be tested: radial-layered, axial-network, spiral, shell-like, fractal-edged and folded-opening. Such a visualisation would be extremely important to a future scientific version of the hypothesis.

The possibility of formalisation makes the hypothesis not only more rigorous, but also more open to development. If concepts remain merely images, they are difficult to refine. Once they become parameters, they can be investigated. Definitions can be revised, features added, algorithms improved, the corpus expanded, results compared and methods debated. This transforms the hypothesis from a closed authorial statement into an open research programme. This is one of its strengths.

At the same time, formalisation must not destroy the philosophical content. Not everything within the hypothesis can be reduced to a number. The meaning of form, cultural symbolism, the experience of wholeness and the philosophical question concerning the recurrence of structures in the world cannot be exhausted by morphometry. Formalisation can, however, distinguish the testable from the interpretative. It demonstrates where the hypothesis possesses an empirical foundation and where philosophical generalisation begins. This does not weaken the study, but makes it more honest and profound.

Formalisation also makes it possible to avoid excessive universality. If everything is declared a manifestation of the Matrix, the hypothesis will lose its scientific meaning. If, however, the degree to which every object corresponds to particular features is specified, it becomes possible to distinguish strong, moderate and weak cases. A flower, for example, may provide a strong example of a radial-layered and opening form. A river network may be a strong example of an axial-network structure. A coastline may exemplify an active fractal edge. Some objects may correspond to only one feature, while others may display virtually no correspondence. Such gradation makes the hypothesis more precise.

The possibility of formalisation is particularly important for the future criticism and defence of the hypothesis. A critic may argue that visual analogies are subjective. The response must be methodological rather than emotional: the features have been defined, the images annotated,

the parameters measured, control groups used, statistical analysis conducted and weak cases excluded. Only such a response can move the hypothesis beyond the realm of impressions. Even if future research confirms only some of its propositions, this will still constitute a significant result because it will clarify which morphological invariants are genuinely robust.

The strength of the hypothesis therefore lies not in its already being complete, but in its capacity to develop towards rigorous testing. It can be strengthened through morphometry, fractal analysis, graph analysis, numerical modelling, computer vision, statistics and the creation of large comparative databases. Such potential is rare among philosophical and visual hypotheses. Many remain at the level of contemplation. The present hypothesis has an opportunity to progress from contemplating form to its formalised investigation.

Thus, the possibility of formalisation is one of the principal strengths of the hypothesis of the Unified Matrix of the Universe. It makes it possible to translate visual and philosophical ideas into a language of features, parameters, models and testable procedures. Morphometry, fractal analysis, graph analysis, numerical modelling, statistics and artificial intelligence can make the hypothesis more rigorous, critically testable and open to scientific development. Formalisation does not eliminate the philosophical dimension of the Matrix, but establishes a boundary between what can be measured and what requires interpretation. It is precisely this boundary that makes the hypothesis methodologically robust and promising.

25.4. A New Terminology of Form

The fourth strength of the hypothesis of the Unified Matrix of the Universe is its capacity to propose a new terminology of form. Every research programme requires not only material and methods, but also a language. Until a phenomenon has been named, it is difficult to retain it within the field of analysis. As long as the features of form are described using incidental expressions—'similar to', 'reminiscent of', 'looks like' or 'shares a common image'—the study remains excessively dependent upon impressions. The further development of the hypothesis therefore requires a system of concepts that will make it possible to describe morphological structures more precisely, consistently and comparably across different fields of knowledge.

Such terminology should not be artificial merely for the sake of novelty. Its purpose is not to create a closed vocabulary for the initiated, but to provide researchers with instruments for distinguishing among forms. A useful term should indicate a specific morphological feature or process. It should be sufficiently evocative to preserve a connection with visual perception and sufficiently rigorous to be used analytically. For this reason, expressions such as 'circle-seed', 'leaf-like unfolding', 'active edge', 'morphogenetic axis', 'structural invariant', 'closed potentiality', 'opened form', 'centre–periphery organisation', 'axial-network type' and 'radial-layered structure' have gradually emerged throughout the book.

The first important term is the concept of the 'circle-seed'. It connects geometric and morphogenetic levels. In this context, the circle is understood not merely as an ideal geometric figure, but as an image of closed potentiality. It delimits space, gathers the form and contains an internal possibility. The seed, in turn, provides a biological example of such potentiality: it is compact and enclosed, possesses a shell and contains a future structure in a hidden state. The 'circle-seed' may therefore designate a morphological type in which the form has not yet opened, but is already organised around an internal centre.

This term is useful because it makes it possible to connect different objects without claiming that they are literally identical. A circle-seed may be a biological seed, a closed bud, a geometric circle within a sacred diagram, the central point of an ornament, a compact shell, the initial cell of a model or a dense nucleus within a distributed medium. In every case, it is a form that has not yet developed its external complexity but already contains the possibility of further morphogenesis. The term helps describe stage A of the A–B–C–D model.

The second important concept is ‘leaf-like unfolding’. This does not mean that all forms are literally leaves or develop in the manner of a leaf. It refers to a morphological type that possesses a central axis, lateral branching, a surface or area of distribution, an active edge and a gradual distribution of structure from the centre towards the periphery. The leaf is the clearest biological example of this type, but leaf-like unfolding may also be used to describe drainage basins, deltas, crack networks, vascular structures, ornamental compositions and certain filamentary forms.

The strength of this term lies in the fact that it describes a principle of organisation rather than a completed image. In a leaf, the midrib establishes direction, the lateral veins create a network, the surface defines an area, and the edge delimits the form and interacts with the environment. Similarly, in a river system, the principal channel and tributaries organise the drainage area; in a vascular network, the principal channel and smaller vessels distribute a flow; and in a cultural ornament, a central line and lateral elements may establish the compositional structure. The term ‘leaf-like unfolding’ makes it possible to perceive this common organisation without conflating the mechanisms involved.

The third key term is the ‘active edge’. In conventional descriptions, an edge is often understood as a simple boundary of a form. Within the present hypothesis, however, the edge has a deeper significance. It is the zone of interaction between the internal and external, the site of growth, rupture, opening, exchange, deformation, a wave, a front or fractal elaboration. The edge of a leaf grows and responds to environmental conditions. The edge of a petal opens and bends. A coastline changes continually under the action of water. The edge of a chemical front demonstrates the propagation of a reaction. The periphery of a nebula records the interaction of a gaseous shell with its environment. The edge of an ornament both completes and activates the composition.

The concept of the active edge is particularly important because it shifts attention from the centre towards the periphery. Many philosophical and symbolic systems tend to absolutise the centre. Morphogenesis, however, is often manifested precisely at the boundary. The centre establishes the initial organisation, while the edge demonstrates how the form comes into contact with the world. The active edge may therefore be regarded as one of the principal diagnostic features of the Matrix. It makes it possible to analyse not only a closed structure, but also its tension-filled boundary, where the form changes, becomes more complex and grows visible.

The fourth term is the ‘morphogenetic axis’. An axis differs from a simple line because it organises a process. In a plant, it may be the stem, the midrib of a leaf, a root or a principal shoot. In an artefact, it may be a vertical compositional line, staff, trunk or central sign. In a geological form, it may be a valley, fault, fold axis or direction of flow. In cosmological images, it may be an elongated structure, an axis of ejection, a filament or a direction in the distribution of matter. The morphogenetic axis determines not only the geometry, but also the order of unfolding: branches, layers, elements, directions, symmetries or asymmetries extend from it.

This term is useful for distinguishing between axial and radial organisation. In a radial form, elements diverge from a centre in every direction. In an axial form, one direction is privileged. A

leaf, tree, valley, channel, staff, vertebral structure or vertically composed artefact belongs to the axial type. A flower, crater, mandala or ring nebula belongs to a radial-centred or centred-layered type. The two principles may nevertheless be combined: a tree possesses an axis and a crown; a flower possesses a centre and petal radii; and a mandala possesses both a centre and axes of symmetry. The term ‘morphogenetic axis’ helps describe such distinctions.

The fifth fundamental concept is the ‘structural invariant’. Within the present study, an invariant is understood not as an unchanging object, but as a recurring relationship of form. Centre and periphery may be an invariant. Axis and lateral branching may be an invariant. Layer and shell may be an invariant. An active edge may be an invariant. The transition from the closed to the opened may be an invariant. These relationships may manifest themselves in different objects, but not necessarily in identical ways. The invariant preserves a structural logic, while the specific form depends upon its material, scale, mechanism and environment.

The concept of the structural invariant is particularly important in protecting the hypothesis against oversimplification. The claim that ‘all forms are identical’ would be false. The claim that ‘structural invariants may recur in different forms’ is considerably more precise. A flower and nebula are not identical, but in some cases they may possess a centre, shell, layers and an active edge. A leaf and river network are not identical, but may possess an axis, branching and spatial distribution. A mandala and crater are not identical, but may be centred-layered forms. The invariant makes comparison possible without conflation.

The sixth term is ‘closed potentiality’. It designates the state of a form before its explicit unfolding. Closed potentiality is neither emptiness nor chaos. It is a state in which the structure remains hidden, compressed, gathered, packaged or contained within a shell. A seed, bud, egg, geode, closed vessel, circle, central point, compact nucleus, initial axiom of an L-system or initial region of a numerical model may all be described through this category. Closed potentiality is important to the understanding of stage A.

The seventh term is the ‘opened form’. It designates a state in which the internal structure has become visible, differentiated, multilayered, branching, radial or peripherally active. An opened flower, unfolded leaf, developed mycelium, formed river network, manifested fault structure, unfolded mandala or nebula with visible shells may all be described as different types of opened form. This term is especially important because it indicates not only a result, but also the process that preceded it. An opened form implies that there was an earlier state of concealment or lesser differentiation.

The eighth concept is ‘centre–periphery organisation’. It describes forms possessing a centre around which, or from which, the periphery is organised. Such forms may include flowers, rosettes, circles, mandalas, craters, ring structures, nebulae, planetary shells, chemical rings and protoplanetary discs. The centre may be geometric, energetic, compositional, luminous, density-based or symbolic. The periphery may be layered, petaloid, filamentary, wave-like, fractured or ornamental. What matters is that centre and periphery are considered not separately, but as a relationship.

The ninth term is the ‘axial-network type’. It designates forms in which the axis, branching, nodes and distribution of connections play the principal role. This type includes leaf venation, trees, roots, mycelia, vascular networks, drainage basins, crack networks, filamentary structures and certain ornaments. The axial-network type differs from the purely radial type in that the structure unfolds through lines, nodes and branches. Important features include branching order, the

principal line, lateral lines, network density, the relationship between centre and periphery, and the active endpoints of growth or propagation.

The tenth concept is the ‘radial-layered structure’. It describes forms in which a centre is surrounded by layers, rings, petals, shells or radial zones. These may include flowers, lotuses, mandalas, the Sri Yantra, craters, chemical rings, planetary nebulae, protoplanetary discs, and certain artefacts and ornaments. Within a radial-layered structure, the number of levels, distances between layers, symmetry, asymmetry, edge activity and the relationship between the central region and external boundary are significant. The term helps unite a broad range of forms without reducing them to a single mechanism.

The eleventh term is the ‘fractal-edged form’. It is required to describe objects in which a complex, self-similar or fractal-like edge performs the principal morphological role. This type includes coastlines, leaf edges, mycelia, microbial colonies, nebulae, clouds, cracks, corals, certain chemical fronts and ornamental lines. In such forms, the centre may be weak or absent, while the principal expressiveness is concentrated at the boundary. This is especially important if the hypothesis is to avoid reducing every structure to centredness. The world of form frequently manifests itself precisely at the edge.

The twelfth term is the ‘folded-opening type’. It describes forms in which the transition from a folded, compressed and internally tensioned state to an unfolded structure is important. A bud, a leaf within a bud, folded tissue, a geological fold, an opening shell, an artefact as an ‘opened bud’, a fan, a lotus rosette or a multilayered mandala may all be considered within this type. Its principal features are the fold, internal tension, layers, opening angle, active edge, sequence of manifestation and the new potentiality arising after opening.

This terminology makes it possible to describe not only objects, but also transitions between states. This is particularly important to the A–B–C–D model. Stage A may be described through the circle-seed and closed potentiality. Stage B may be described through the morphogenetic axis, rupture, initial opening and activation of the edge. Stage C may be described through the opened form, radial-layered structure, axial-network unfolding or fractal-edged complexity. Stage D may be described through a new seed potentiality, secondary centre, fruit, node or daughter form. The terminology makes this scheme more flexible and analytically precise.

The new terminology of form also helps avoid excessively mystical language. If the hypothesis speaks of the centre, axis, layer, active edge, fractal complexity, branching, closure and opening rather than relying upon undefined expressions, it becomes more amenable to scientific discussion. This does not entail abandoning philosophical depth. On the contrary, philosophical thought becomes stronger when it rests upon clear concepts. Terminology makes it possible to maintain a balance between imagery and rigour.

New terms must nevertheless be introduced cautiously. Every term should be explained, linked to observable features and, where possible, open to formalisation. If a term cannot be applied analytically, it risks becoming merely decorative. The ‘active edge’, for example, is useful because it can be associated with curvature, growth, a front, a gradient and fractal dimension. The ‘morphogenetic axis’ is useful because it can be identified and measured within an image. The ‘structural invariant’ is useful because it establishes a principle of comparison. A term must function, not merely sound appealing.

It is also important to distinguish between the author’s terms and established scientific concepts. Words such as symmetry, fractality, morphometry, graph, diffusion, reaction, fold,

contour, axis and layer possess scientific or widely accepted meanings. Authorial expressions—the ‘circle-seed’, ‘leaf-like unfolding’, the expanded sense of ‘active edge’ and the ‘morphogenetic axis’ within the context of the Matrix—must be coordinated with those meanings without replacing them. This is important for interdisciplinary communication. The new language should be intelligible to specialists from different fields rather than enclosing the hypothesis within its own terminological system.

The terminology of form may become the foundation of a future dictionary of the Matrix. Such a dictionary should include a definition of every term, visual examples, possible measurable features, areas of application, limitations and typical interpretative errors. For the term ‘active edge’, for example, it might specify a biological example—the edge of a leaf or petal; a geological example—a coastline or erosion front; a chemical example—a reaction front; a cosmological example—the edge of a gaseous shell; and a cultural example—an ornamental boundary. It should then list the parameters: curvature, irregularity, gradient, fractal dimension and dynamics of change. Such a dictionary would make the hypothesis considerably more robust.

The new terminology also facilitates work with illustrations. If an image caption refers not merely to the ‘similarity of forms’, but to ‘axis, branching and active edge’, the reader immediately understands where to direct attention. If a caption specifies a ‘radial-layered structure’, attention is directed towards the centre and layers. If it refers to ‘closed potentiality’, the object is perceived as a stage within a process rather than as an immobile object. Terminology therefore guides vision. It helps the reader see not everything simultaneously, but specifically those features that are significant to the analysis.

The new terminology may also provide a means of connecting scientific and artistic description. Form always has a dual nature: it is measurable and simultaneously perceptible. Dry technical language often loses the image. Purely poetic language loses testability. Terms such as ‘circle-seed’ or ‘leaf-like unfolding’ preserve imagery while remaining capable of incorporation into an analytical system. This is particularly important to a study situated at the intersection of science, philosophy and visual culture.

Another strength of the new terminology is that it may reveal relationships that previously went unnoticed. Once the concept of the active edge has been introduced, it becomes possible to compare a coastline, leaf edge, chemical front, nebular periphery and ornamental boundary. Once the concept of the axial-network type has been introduced, leaf venation, river networks, blood vessels, mycelia and cracks enter a shared analytical field. Once the radial-layered structure has been introduced, flowers, craters, nebulae, mandalas and ring patterns may be compared. A term creates a domain of comparison.

This strength also entails responsibility. A term can unite, but it can also distort. If a single term is applied too broadly, it will lose its meaning. If every complex edge is described as active, for example, the concept will cease to distinguish among forms. If every line is described as a morphogenetic axis, the term will become empty. If every circle is declared a circle-seed, the distinction between a geometric boundary and a potential structure will disappear. Every term must therefore possess criteria of application. The new terminology should be analytical rather than indefinitely expansive.

In the longer term, the terminology of form may become one of the most independent contributions of the study. Even if future research refines or limits the hypothesis of the Matrix, the proposed language may prove useful for describing morphological structures. It may be employed in comparative morphology, visual analytics, cultural studies, the philosophy of form,

design, scientific illustration, educational materials, computer vision and complex-systems theory. A useful terminological apparatus may outlast an individual hypothesis if it helps observers perceive and describe phenomena more precisely.

Several terminological groups may be proposed for the further development of the hypothesis:

- group 1 — terms of state: closed potentiality, opened form, new seed structure;
- group 2 — terms of organisation: centre–periphery structure, morphogenetic axis, axial-network type, radial-layered form;
- group 3 — terms of boundary: active edge, fractal-edged form, shell, contour of manifestation;
- group 4 — terms of process: opening, branching, folding, rupture, self-similar complexification, return to potentiality;
- group 5 — terms of comparison: structural invariant, morphological profile, morphogenetic triad, parametric proximity.

Such a grouping would help make the dictionary systematic.

The term ‘morphological profile’ is especially important. It may designate the combination of features belonging to a particular form. The profile of a flower, for example, may include centredness, radiality, layers, active edge and opening. That of a river network may include axis, branching, hierarchy, active basin and fractal complexity. That of a nebula may include shell, layers, filaments, asymmetry and active edge. The morphological profile makes it possible to compare objects not according to a single feature, but according to a combination of features. This is important for future formalisation.

The term ‘morphogenetic triad’ is no less important. It may designate not merely a set of three beautiful images, but a methodological technique for comparing objects from different levels according to a shared morphological profile. A BIO–GEO–COS triad, for example, should include a biological object, a geological or geophysical object and a cosmological object united by features specified in advance. Such a triad may be strong, moderate or weak depending upon the measurable similarity. The term helps transform a visual composition into a unit of research.

The term ‘parametric proximity’ is also important. It designates the similarity of objects within a space of measurable features. Two forms may appear visually similar while being parametrically distant. Conversely, forms with different external appearances may be close in terms of their branching structure or fractal complexity. This concept is particularly important for the future application of computer vision and statistics. It helps replace the subjective ‘looks similar’ with the more precise formulation ‘possesses a similar morphological profile according to the specified parameters’.

Thus, the new terminology of form is not an external embellishment of the hypothesis, but one of its methodological foundations. It makes it possible to progress from image to analysis, from analogy to feature, from impression to profile, and from an individual illustration to classification. It makes the hypothesis discussable, testable and open to development. Without such terminology, the book might have remained a beautiful visual and philosophical essay. With it, the book has an opportunity to become the foundation of a comparative morphological programme.

The strengths of the hypothesis of the Unified Matrix of the Universe lie in its interdisciplinarity, visual persuasiveness, capacity for formalisation and ability to propose a new language for describing form. It unites different fields of knowledge, draws upon perceptible morphological

parallels, allows their translation into parameters and models, and creates a terminological apparatus for analysing centres, axes, layers, branching, active edges, opening and structural invariants. These strengths do not eliminate the need for criticism and testing, but they demonstrate that the hypothesis possesses potential not only as a philosophical idea, but also as a developing research programme.

Chapter Twenty-Six

Risks and Weaknesses of the Hypothesis

26.1. The Risk of Excessive Analogising

The principal risk facing the hypothesis of the Unified Matrix of the Universe is that of excessive analogising. This occurs when a visual resemblance between objects belonging to different levels begins to be regarded as sufficient evidence of a profound connection, common origin or shared mechanism of formation. This danger accompanies every broad morphological hypothesis. The richer the visual material and the more expressive the comparisons among a flower, leaf, river, nebula, ornament, tree, crater or galactic spiral, the greater the temptation to draw a rapid conclusion: if the forms look alike, they must be organised in the same way. Such a conclusion, however, would be methodologically mistaken.

Visual similarity is the beginning of an investigation, not its conclusion. It may indicate the presence of a shared morphological feature: a centre, axis, branching, layer, active edge, radiality, spirality, fractal complexity or folded opening. By itself, however, it does not prove a causal connection. Leaf venation and a river network may indeed possess a similar branching organisation, but a leaf forms through biological growth, cellular differentiation and the transport of substances, whereas a river network arises through erosion, relief, water runoff, climate, lithology and geological time. Similarity in branching does not eliminate differences between mechanisms.

The same applies to comparisons between a flower and a nebula. A flower is a plant organ associated with reproduction, tissues, growth, a genetic programme and interaction with the environment. A nebula is a cosmic object associated with gas, dust, radiation, gravity, shock waves, stellar evolution and observational wavebands. Both may exhibit radiality, layering, central organisation or an active edge. This does not mean, however, that a nebula ‘grows like a flower’ or that a flower is a ‘small-scale model of a nebula’ in a causal sense. It is more accurate to state that certain similar morphological relationships may be identified in both cases and require further analysis.

Excessive analogising is particularly dangerous because it replaces investigation with a predetermined meaning. Instead of asking ‘which features genuinely coincide?’, the study asserts that ‘these forms belong to the same type’. Instead of testing ‘how statistically significant is this similarity?’, it assumes that ‘the similarity is obvious’. Instead of distinguishing among mechanisms, it introduces a universal formula. The hypothesis consequently becomes vulnerable to criticism because it may be accused of selecting beautiful examples, engaging in pareidolia, relying upon arbitrary symbolism and disregarding disciplinary explanations.

To preserve the scientific strength of the hypothesis, several levels of analogy must be distinguished clearly:

- level 1 — visual analogy. This arises when two forms appear similar to the eye;

- level 2 — morphological analogy. This requires the identification of specific features of similarity: branching, radiality, layers, contour, axis, centre or fractal complexity;
- level 3 — parametric analogy. This involves measuring the features and comparing their numerical characteristics;
- level 4 — functional or process-based analogy. This requires demonstrating that the forms not only look similar, but also develop according to comparable dynamic principles;
- level 5 — causal analogy. This is the strongest and most hazardous claim because it presupposes similarity between mechanisms.

In most cases, the hypothesis of the Matrix should remain at the second and third levels, occasionally progressing to the fourth, but approaching the fifth with extreme caution.

This distinction helps prevent substitution between different kinds of claims. A leaf and river may be visually and morphologically similar as branching structures. Graph analysis can be used to test their parametric proximity through nodes, branches, angles, orders and network density. In certain respects, it may be possible to speak of a process-based analogy involving the distribution of flows through a branching system. A causal analogy, however, would remain limited because a leaf and river are formed by different mechanisms. It is precisely this degree of precision that makes the comparison strong. It demonstrates similarity where it genuinely exists without extending it into areas in which it has not been established.

The risk of excessive analogising is also connected with the selection of examples. If a researcher chooses in advance only those images that correspond closely to the hypothesis, they may create a highly convincing but methodologically weak visual sequence. It is possible, for example, to find a nebula resembling a flower, a river network resembling a leaf, a crater resembling a mandala and an ornament resembling a biological structure. If thousands of objects that do not exhibit such similarities are excluded, however, the resulting picture will be biased. The hypothesis must therefore work not only with strong examples, but also with ordinary, random, borderline and negative cases.

Negative cases are especially important because they demonstrate the limits of the hypothesis's applicability. Not every biological form possesses pronounced radiality. Not every river network resembles a leaf. Not every nebula possesses a centre and shell. Not every artefact can be interpreted as a scheme of morphogenesis. Not every ornament is connected with the observation of natural structures. If the hypothesis does not acknowledge such exceptions, it becomes an unfalsifiable system in which every object is declared evidence in advance. This weakens its scientific status. A strong hypothesis must be capable of stating: the similarity is strong here, moderate here, weak here and absent here.

Particular caution is required with analogies across different scales. Comparisons among biological, geological and cosmological levels may be visually striking, but they also carry the greatest risk. The scales differ by enormous orders of magnitude. The materials, forces, temporal processes and methods of observation are radically different. Similarities between forms at different scales should therefore be interpreted not as direct proof of a shared nature, but as a reason to investigate the recurrence of structural relationships. In other words, the hypothesis may discuss cross-scale morphological invariants, but it must not assert a cross-scale identity of processes without specific evidence.

The risk of excessive analogising is also manifested in language. Certain expressions may sound too categorical: 'the nebula repeats the flower', 'the river is a leaf of the Earth', 'the artefact proves ancient knowledge of the Matrix' or 'the cosmos is constructed according to the same

scheme as a plant'. Such formulations are striking but hazardous. They transform a cautious hypothesis into a metaphysical assertion lacking sufficient verification. More accurate language would state that 'the nebula may be considered an object with a radial-layered morphology', 'the river network exhibits features of the axial-network type', 'the artefact permits a morphological reading' or 'similar structural invariants may manifest themselves at different levels'. Such language is less dramatic but considerably more precise.

It is also important to distinguish between analogy and homology. In biology, homology signifies a similarity associated with common origin, while analogy denotes a similarity that arose independently through different mechanisms or functions. This distinction is also useful in a broader philosophical and morphological sense. The hypothesis of the Matrix deals primarily with analogies rather than homologies. It does not claim that a leaf, river and nebula share a common historical source. It proposes that comparable forms of organisation may arise in different systems. It is therefore terminologically important not to replace analogical similarity with a claim concerning common origin.

Another danger lies in transferring function. The resemblance of two forms does not mean that they perform the same function. The branching of a leaf is associated with transport and the support of tissue; the branching of a river network with water drainage; a vascular network with the circulation of blood or other substances; mycelium with the colonisation of a substrate and the acquisition of nutrients; and a cosmic filamentary structure with the distribution of matter within a gravitational environment. Similarity of network form does not entail functional identity. Function must therefore be analysed separately from form. The hypothesis may compare morphology, but it should not automatically transfer function from one level to another.

Cultural analogies are particularly vulnerable. An artefact, relief, ornament, sacred diagram or crop circle may be morphologically interesting, but it cannot be interpreted solely through the Matrix. Every cultural object possesses an archaeological, historical, religious, technological, artistic and social context. If a researcher identifies an axis, circle, star or plant within an artefact, this does not mean that the ancient culture consciously recorded a universal morphogenetic scheme. Such an interpretation is possible only as an additional layer after the primary cultural context has been considered. Otherwise, the analogy becomes an overinterpretation.

Excessive analogising may also arise when working with mathematical models. If a reaction–diffusion model produces a pattern resembling biological pigmentation or a cosmic structure, this does not mean that the real object arose through the same mechanism. If an L-system generates a tree, this does not mean that a real tree can be reduced entirely to a formal grammar. If a fractal iteration resembles a coastline, this does not exhaust the geomorphology of the coast. A numerical model demonstrates a possible generative principle, but does not replace the real mechanism. Here, too, formal similarity must be distinguished from causal explanation.

Several methodological rules should be introduced to reduce the risk of excessive analogising:

- rule 1: every comparison must begin with a description of the specific features of similarity;
- rule 2: the differences must be identified after the similarities;
- rule 3: the formation mechanism of every object must be considered within the relevant discipline;
- rule 4: wherever possible, visual analogy must be translated into morphometric parameters;
- rule 5: strong examples must be tested against random and control samples;
- rule 6: interpretations must be formulated as hypotheses rather than final proof.

These rules do not weaken the study; they strengthen it. Readers are more likely to trust a hypothesis when they see that the author does not conceal its weaknesses. Acknowledging the risk of excessive analogising demonstrates methodological maturity. It states that visual parallels are important but require testing; that forms may indeed be similar, but that this similarity possesses different levels; and that the hypothesis proposes a broad framework without invalidating the specific sciences. Such a position makes the project more resistant to criticism.

The morphological profile is an important instrument for protection against excessive analogising. If every object is described according to a common scheme—centre, axis, layers, branching, edge, symmetry, fractality, degree of opening, data type, scale, mechanism of origin and limitations of interpretation—the comparison becomes more disciplined. The researcher can no longer simply state: 'this looks similar'. They must identify which features coincide, which do not, which have been measured and which remain hypothetical. The morphological profile transforms analogy into analysis.

Statistics and computer vision are equally important. They make it possible to test whether a selected analogy is merely the result of subjective selection:

- if an authorial BIO–GEO–COS triad is parametrically closer than random triads, this strengthens the comparison;
- if it is not, the analogy must be weakened or excluded;
- if an algorithm recognises similarity in the same cases as the author, the result is noteworthy;
- if the algorithm groups the objects differently, the visual interpretation should be reconsidered.

Formalisation therefore helps counteract excessive analogising.

It is important to emphasise that rejecting excessive analogising does not mean rejecting analogical thought altogether. Analogy is an important instrument of science and philosophy. It helps identify relationships, formulate hypotheses, transfer methods, construct models and open new questions. The problem lies not in analogy itself, but in assigning it an inappropriate status. Analogy should be a source of hypotheses, not a substitute for evidence. When this rule is observed, analogical thinking becomes productive. When it is violated, the hypothesis becomes vulnerable.

Within the present project, analogy should function as a heuristic. It indicates a possible direction of inquiry: here there is similarity in branching; here, radial layering; here, an active edge; and here, folded opening. Testing must then begin. If testing confirms the stability of the features, the analogy acquires a higher status. If it does not, the analogy remains a visual or philosophical metaphor. This approach preserves the creative strength of the hypothesis while protecting it from arbitrariness.

The risk of excessive analogising is particularly great because the very subject of the study—the Unified Matrix of the Universe—involves a search for unity. The search for unity, however, must not destroy differences. The genuine strength of the hypothesis lies not in erasing the boundaries among biology, geology, cosmology and culture, but in demonstrating possible structural correspondences among them. If unity exists, it must be understood as the unity of certain relationships of form rather than the sameness of all things. This distinction is fundamental.

The following formula must therefore be maintained throughout the subsequent exposition: similarity of form does not equal identity of cause. This formula should constitute one of the methodological foundations of the entire study. It makes it possible to discuss morphological

invariants without slipping into pseudoscientific universalism. It protects the hypothesis against its principal criticism while simultaneously increasing its precision. The more consistently the book observes this rule, the stronger its research position will become.

Thus, the risk of excessive analogising is the principal weakness of the hypothesis of the Unified Matrix of the Universe. Visual similarities between objects at different levels may be impressive, but they do not constitute evidence of a causal connection. To preserve the scientific robustness of the hypothesis, it is necessary to:

- distinguish among visual, morphological, parametric, process-based and causal analogy;
- account for differences between mechanisms;
- work with control samples;
- acknowledge negative cases;
- translate similarities into measurable features.

Only under these conditions does analogy become not a threat to the hypothesis, but a productive heuristic instrument.

26.2. The Risk of Mystification

The second serious risk facing the hypothesis of the Unified Matrix of the Universe is that of mystification. It arises because the subject of the study—universal forms, recurring invariants and similarities among biological, geological, cosmological and cultural structures—may easily be perceived not as a scientific and philosophical hypothesis, but as a claim concerning some hidden mystical force governing the world. Such a transition would be dangerous for the project. It would make the hypothesis vulnerable to criticism, weaken its methodological rigour and potentially move it from the sphere of scientific discussion into that of arbitrary esoteric interpretation.

The risk of mystification is particularly high wherever the text introduces powerful images: the Matrix, World Tree, seed, lotus, circle, sacred geometry, Sri Yantra, ancient reliefs, cosmic structures, spirals, mandalas and crop circles. Each of these images possesses cultural, symbolic or emotional intensity. They readily evoke associations with secret knowledge, ancient wisdom, a hidden code of the Universe, supernatural design or a mystical structure underlying reality. The book must distance itself from precisely these interpretations if it is to preserve its character as a research project.

Within the present hypothesis, the concept of the Matrix should not signify a mystical substance, invisible energy, supernatural programme, secret intelligence or force directly governing every form in the world. Such an interpretation would immediately place the hypothesis beyond the boundaries of testability. If the Matrix is declared to be an undefined force that cannot be measured, defined, limited or disproved, it ceases to be a scientific hypothesis and becomes a metaphysical assertion. Metaphysical ideas are possible within philosophy, but the purpose of this book is different: to propose a structural, morphological and methodologically cautious hypothesis.

The Matrix must therefore be understood primarily as a structural logic of form. It designates not a mysterious entity, but a proposed set of recurring morphogenetic relationships: centre and periphery, axis and branching, layer and shell, closure and opening, active edge, self-similarity,

the transition from potentiality to manifestation and the emergence of a new cycle. Understood in this way, the Matrix is not a mystical object, but a conceptual model. It can be discussed, refined, tested, limited, formalised and criticised.

The risk of mystification arises when structural logic begins to be described as the hidden cause of everything. To say that every form in the world exists because 'the Matrix makes it assume that form', for example, would be a weak assertion. It explains nothing because it replaces specific mechanisms with a general word. A biological form arises through biological processes; a geological form through geological processes; a cosmological form through astrophysical processes; and a cultural form through human history, symbolism and technique. If the term Matrix is used, it may designate only a shared level of morphological description, not a substitute for causal mechanisms.

It is especially important to avoid claims that ancient cultures supposedly possessed direct knowledge of a universal Matrix in the modern scientific sense. Artefacts, reliefs, ornaments, sacred diagrams and mythological trees may be incorporated into comparative morphology. They may demonstrate that humans recorded persistent images of growth, axes, centres, layers, circles, plants, water, stars and opening. It does not follow, however, that an ancient craftsperson, priest or artist consciously encoded a universal scientific scheme of morphogenesis. Such an interpretation would constitute overinterpretation and would bring the hypothesis closer to mystifying theories of ancient secret knowledge.

Sacred geometry must likewise be approached cautiously. The Sri Yantra, mandalas, circles, lotus structures, ornaments and other geometric forms may indeed be considered visual models of the centre, layers, nesting and opening. They nevertheless possess their own religious, philosophical, ritual, artistic and historical contexts. They cannot be reduced solely to evidence of the Matrix. Still less can they be said to prove the existence of a supernatural geometric code of the Universe. It is more accurate to state that these forms permit a morphological reading as one possible analytical layer.

Crop circles require particular caution. This subject is especially likely to draw the study into mystification because it is surrounded by numerous non-scientific, conspiratorial and fantastical interpretations. Within the present study, crop circles may be considered only as visual and geometric structures: compositions with centres, rings, spirals, radiality, active edges, chains of circles and landscape-scale organisation. Their origin must not be used as an argument for an extraterrestrial, mystical or supernatural source. Even if a particular formation of unknown origin is morphologically interesting, this does not make it evidence of the Matrix.

Cosmological data may also contribute to mystification if handled carelessly. Nebulae, galaxies and cosmic clouds are visually impressive and often evoke a sense of the sublime unity of the world. The scientific strength of their analysis, however, does not lie in this emotional effect. Cosmic images are produced through observations, data processing, the selection of radiation wavebands and visualisation. They must be approached through astrophysics and morphometry rather than mystical awe. If a nebula resembles a flower, this may provide a reason to analyse radiality, shells and an active edge, but it is not evidence of cosmic symbolism.

It is particularly important to distinguish philosophical depth from mystification. Philosophical depth emerges when the study of form leads to questions concerning order, recurrence, structure, wholeness, relationships between levels, the limits of knowledge and the nature of invariants. Mystification begins when these questions are declared already resolved through an undefined force or hidden knowledge. Philosophy permits an open question. Mystification offers

a closed answer without verification. The hypothesis of the Matrix must remain philosophically open and methodologically testable.

To protect the hypothesis against mystification, it is necessary to return continually to disciplinary mechanisms:

- if a leaf is analysed, botany, growth, tissues and venation must be considered;
- if a river is analysed, geomorphology, relief and hydrology must be considered;
- if a nebula is analysed, astrophysics must be considered;
- if an artefact is analysed, archaeology and cultural context must be considered.

The Matrix must not become an explanation that replaces these mechanisms. It can function only as a comparative level superimposed upon them. This methodological rule must extend throughout the entire study.

The second rule is formalisation. The more precise the concepts become, the less space remains for mystification. If the 'active edge' is defined through curvature, gradient, a front, fractal dimension or a zone of growth, it is a research term. If it is described as an 'energetic boundary of secret manifestation', it becomes a mystical image. If a 'morphogenetic axis' can be extracted from an image and measured, it is an analytical feature. If it is understood as an invisible spiritual line, the hypothesis loses its scientific robustness. Formalisation therefore serves not only as an instrument of testing, but also as a safeguard for the language of the study.

The third rule is to distinguish between metaphor and model. A metaphor helps us think. A model helps us test. The image of the seed may be a metaphor for potentiality, but the A–B–C–D model must describe parameters of closure, opening, layers, branching and the new centre. The image of the tree may be a philosophical symbol connecting different levels, but an L-system or graph analysis provides a model of branching. The image of the lotus may be culturally expressive, but the biological opening of a flower can be measured. If a metaphor is not translated into a model, its status must remain metaphorical. It cannot be presented as evidence.

The fourth rule is openness to negative results. Mystifying systems are often structured so that every observation is declared confirmatory. If an object resembles the Matrix, it constitutes confirmation. If it does not, the Matrix is said to be hidden. If the data agree, they are evidence. If they do not, the researcher is said to have failed to perceive the deeper level. Such an approach makes the hypothesis unfalsifiable. A scientifically oriented hypothesis must operate differently: some objects may support particular features, while others may not; some analogies may be strong and others weak; and part of the idea may be refined or rejected. This principle is fundamental to protecting the hypothesis against mystification.

The fifth rule is the transparency of sources and images. This is especially important for cosmic and cultural material. Real observational data must be distinguished from artistic visualisations; archaeological artefacts from reconstructions; laboratory experiments from generated images; and cultural symbols from modern stylisations. If the origin of an image is unclear, it cannot be used as strong evidence. Images in the book may serve illustrative purposes, but its evidential component must rest upon verifiable data. This also reduces the risk of mystification.

The sixth rule is the rejection of absolute conclusions. Formulations such as 'everything in the world is constructed according to a single Matrix' may sound impressive, but they are scientifically too strong and insufficiently testable. It is more accurate to state that 'recurring morphological invariants may manifest themselves in different systems', 'the hypothesis

proposes the possibility of a common language for describing form', 'the Matrix is understood as a structural logic requiring further testing' or 'individual features can be formalised and compared'. Such language preserves the scale of the idea without transforming it into dogma.

It is especially important to acknowledge the risk of mystification explicitly because the hypothesis itself lies at the intersection of science, philosophy and visual culture. Boundaries are always hazardous. On the one hand, new ideas frequently emerge at the boundaries between disciplines. On the other, it is precisely there that criteria of verification may most easily be lost. The book must therefore maintain a dual position: it must be sufficiently bold to pose a broad question concerning the form of the Universe and sufficiently cautious not to replace that question with a mystical answer. This balance is one of the principal conditions of its intellectual reliability.

It is also important to understand that rejecting mystification does not mean rejecting symbols. Symbolic forms are genuinely significant. The World Tree, lotus, circle, star, spiral and mandala are powerful cultural images. They should not be excluded from the study merely because they are associated with religious or sacred contexts. They must, however, be approached competently: as cultural structures, visual models, historical symbols and possible morphological schemes. A symbol may be an object of analysis, but it must not be transformed into uncritically accepted evidence.

This approach makes it possible to preserve the richness of the material without descending into mysticism. The book may discuss sacred geometry while analysing it as a multilayered geometric structure. It may discuss the World Tree while treating it as a cultural model of an axis, levels and branching. It may discuss reliefs while separating their archaeological context from the author's morphological interpretation. It may discuss the cosmos while relying upon morphological parameters derived from images. It may use the word 'Matrix' while defining it as a structural logic rather than an undefined force.

Rejecting mystification is also important for dialogue with the scientific community. A scientist may not accept the philosophical scope of the hypothesis, but may nevertheless be willing to discuss specific questions: how the active edge is measured, how an image database is constructed, how branching networks are compared, how triads are tested, which models are used and what data are available. If the hypothesis instead speaks in the language of secret codes and mystical knowledge, such a dialogue becomes virtually impossible. Scientific communication therefore requires clarity, limited claims and a willingness to submit them to testing.

In this sense, the risk of mystification is not only an external danger, but also an internal test of the hypothesis. It must demonstrate its maturity through its ability to constrain its own language. The more powerful the image, the more precise the methodological framework must be. The broader the idea, the more rigorous its definitions must become. The more levels of the world it connects, the clearer the boundaries among analogy, model, symbol and evidence must be.

Thus, the risk of mystification is one of the key weaknesses of the hypothesis of the Unified Matrix of the Universe. It arises when a structural hypothesis concerning recurring forms begins to be perceived as a claim concerning a secret force, ancient hidden knowledge, a supernatural code or a mystical programme of the world. To avoid this risk, the Matrix must be understood strictly as a structural logic of form; metaphor must be distinguished from model; disciplinary explanations must be preserved; absolute and esoteric formulations must be avoided; and the analysis must rely upon morphometry, numerical modelling, statistics and verifiable data. Only

under these conditions can the hypothesis remain philosophically profound without becoming mystified.

26.3. The Risk of Indeterminacy in the Concept of the ‘Matrix’

The third serious risk facing the hypothesis of the Unified Matrix of the Universe is the indeterminacy of the concept of the ‘Matrix’ itself. This is perhaps one of the most important methodological questions in the entire study. If the central term remains excessively broad, figurative or unclear, the whole hypothesis becomes vulnerable. The reader may ask: what exactly is called the Matrix? Is it a law of nature? A geometric scheme? A mathematical model? A philosophical principle? A morphological invariant? A hidden cause? A figurative language? Unless a sufficiently precise answer is provided, the concept will begin to lose definition and become a universal explanation without rigorous content.

The danger of indeterminacy lies in the fact that an excessively broad concept can easily begin to explain everything and therefore, in practice, explain nothing. If every form, ornament, branching structure, spiral, circle and similarity is declared a manifestation of the Matrix, the Matrix becomes an unfalsifiable concept. It would then be impossible to indicate where it is strongly manifested, where it is weakly manifested and where it is entirely absent. Such a situation is dangerous for the hypothesis because it turns it into a closed interpretative system: everything is included in advance, and nothing can be excluded. By contrast, the scientific and methodological strength of the hypothesis requires the possibility of differentiation.

The concept of the Matrix must therefore be strictly delimited. Within the present study, the Matrix should be understood neither as a substance, energy, mystical force, intelligent design nor hidden programme governing the objects of the world. It should be defined as a structural logic of form generation: a proposed set of recurring morphological relationships that may manifest themselves within different systems governed by different mechanisms. These relationships include centre and periphery, axis and branching, layer and shell, active edge, closure and opening, self-similarity, radiality, spirality, the transition from a potential state to a manifested form and the formation of a new cycle.

Such a definition immediately establishes boundaries. The Matrix does not replace physical, biological, geological, cosmological or cultural causes. It does not explain why a particular leaf grows in precisely that manner, why a river follows a particular channel, why a galaxy possesses a particular structure or why an ancient artefact was given a particular composition. These questions must be addressed within the relevant disciplines. In the strict sense, the Matrix designates a different level: the recurrence of structural relationships of form that may be described, compared, formalised and tested.

The Matrix is therefore not a causal entity, but an analytical model. This distinction is fundamental. A causal entity answers the question: what produced the object? An analytical model answers the question: which relationships may be identified within the form of the object, and how do they compare with relationships found in other objects? If the Matrix is understood as the cause of everything, it becomes indeterminate and mystified. If it is understood as a model of structural relationships, it becomes an operational concept. It can then be refined, measured through features, criticised and applied within different fields.

The indeterminacy of the concept of the Matrix may also arise from the scale of the idea itself. The expression ‘the Universe’ implies the greatest possible breadth. It encompasses nature, culture, the cosmos, matter, form, meaning, life and non-living processes. The breadth of the subject, however, must not entail conceptual vagueness. On the contrary, the broader the intended area of application, the more precise its central vocabulary must become. If the Matrix claims cross-level significance, it must be defined not as a universal substance, but as a minimal set of invariant relationships. Only then can it be applied to different objects without arbitrary expansion.

Several levels of understanding the Matrix may be proposed:

- level 1 — visual and morphological. Here, the Matrix denotes recurring features of form visible in images: centres, axes, layers, branches, edges, spirals and contours;
- level 2 — parametric. Here, the Matrix is understood as a set of measurable characteristics: degree of centredness, number of layers, degree of branching, fractal dimension, edge asymmetry and degree of opening;
- level 3 — generative. Here, the Matrix denotes possible rules capable of producing forms: reaction–diffusion regimes, L-systems, fractal iterations, folding and opening;
- level 4 — philosophical. Here, the Matrix constitutes an idea concerning the recurrence of structural principles in different domains of the Universe.

These levels must be distinguished.

Confusion arises when they are conflated. Visual similarity, for example, may mistakenly be taken as philosophical proof. Parametric proximity may be interpreted as causal identity. A generative model may be declared a universal law. A philosophical idea may begin to be used as an explanation for a specific object. To avoid this, it is necessary to specify each time the level at which the word ‘Matrix’ is being used. In one case, it refers to a visible structure; in another, to a numerical profile; in a third, to a generative model; and in a fourth, to a philosophical generalisation.

It is particularly important not to confuse the Matrix with a geometric template. If it is understood as a single fixed scheme—e.g., a circle, flower, tree, spiral or A–B–C–D—the hypothesis will become both excessively narrow and highly vulnerable. There is no single form that is mechanically repeated everywhere in the world. Real objects differ in material, scale, environment, mechanism and history. The Matrix should therefore not be understood as a design or blueprint. It should be understood as a space of morphogenetic possibilities within which different forms occupy different regions. Some are closer to the radial-layered type, others to the axial-network type, others to the fractal-edged type and still others to the folded-opening type.

This interpretation makes the hypothesis more flexible and precise. The Matrix does not state that all forms have the same appearance. It proposes that many forms may be described through a limited set of recurring structural relationships. This distinction is fundamental. Under the first interpretation, the hypothesis can easily be refuted by the existence of numerous dissimilar objects. Under the second, it becomes a research programme: the set of relationships must be defined, their degree of expression measured, a typology of forms constructed and the stability of their manifestation across different systems tested.

The risk of indeterminacy is also connected with the possibility that the concept of the Matrix may begin to be used as a metaphor for any kind of order. If symmetry is present, it is the Matrix. If chaos is present, it is a hidden Matrix. If branching is present, it is the Matrix. If branching is

absent, it is another form of the Matrix. Such an approach renders the term meaningless. It must therefore be stated that not every instance of order constitutes a manifestation of the Matrix in the strict sense. The inclusion of an object in the analysis requires specific features and their combinations. The presence of a single circle, for example, does not imply a strong correspondence to the Matrix. A morphological profile is required: centre, boundary, layers, active edge, opening and relationships with other elements.

The Matrix must consequently be a gradational concept. An object may demonstrate strong, moderate, weak or no correspondence to a particular type of the Matrix. A flower may be a strong example of a radial-layered and opening form. A river network may be a strong example of axial-network organisation. A coastline may be a strong example of a fractal-edged form. Certain objects may possess only one feature and should therefore not be used as strong evidence. Such gradation protects the hypothesis against excessive expansion.

To clarify the concept of the Matrix, it is useful to distinguish between the ‘Matrix as invariant’ and the ‘Matrix as process’. In the first case, attention is directed towards stable relationships of form: centre, axis, layer, branching and edge. In the second, it is directed towards transitions: closure, opening, growth, branching, self-similar complexification and the return to a new potentiality. Both aspects are important. If only invariants are considered, form becomes excessively static. If only process is considered, structural determinacy is lost. The Matrix must therefore be understood as a unity of morphological invariants and morphogenetic dynamics.

The relationship between the concept of the Matrix and the A–B–C–D model is particularly important. This model helps concretise the hypothesis, but should not exhaust it completely. A–B–C–D describes one of the central types of morphogenetic cycle: closed potentiality, the beginning of opening, manifested structure and new potentiality. Not every form in the world, however, must pass strictly through these four stages. In some objects, stage D is weakly expressed. In certain processes, an initial state of closure is difficult to identify. In some structures, branching is more important than opening. A–B–C–D is therefore an important model of the Matrix, but not its only possible expression.

The Matrix must also be distinguished from a ‘morphological type’. The Matrix is a more general concept designating the structural logic of form. A morphological type is a specific mode of its manifestation: radial-layered, axial-network, fractal-edged, folded-opening, centred-shell, spiral, labyrinthine or spotted-field. Unless this distinction is maintained, the term Matrix will be applied too broadly. It is far more productive to state that a particular object does not merely ‘manifest the Matrix’, but belongs to a specific morphological type possessing specified features.

A working definition may be proposed for the future scientific development of the hypothesis: the Matrix is a hypothetical system of recurring morphological invariants and morphogenetic transitions manifested in different natural, cultural and experimental forms and describable through parameters of centre, axis, layers, branching, edge, symmetry, opening, self-similarity and cyclicity. This definition is not final, but it establishes a sufficiently rigorous framework. It excludes a mystical force, universal cause and vague image. It makes the Matrix an object of analysis.

It is also necessary to define what the Matrix is not. The Matrix is not every similarity. It is not every symmetry. It is not every beautiful form. It is not every ancient symbol. It is not every correspondence between images. It is not a mathematical formula that automatically explains the world. It is not a hidden energy or wfig. Such a negative definition is useful because it protects

the term against unlimited expansion. A concept becomes stronger when its boundaries are known.

The risk of indeterminacy is also manifested in a potential conflict between the philosophical and scientific uses of the term. In philosophical language, the Matrix may be a broader metaphor for structural order. In scientific and methodological language, it must be restricted to measurable features and models. Both usages are possible, but they must not be conflated within a single argument. A philosophical section may discuss the Matrix as an ultimate idea of form. A methodological section must discuss morphological invariants, parameters and testable features. Such linguistic discipline is particularly important in the concluding chapters of the study.

One means of avoiding indeterminacy is to introduce levels of evidential strength. It is possible, for example, to distinguish among weak, intermediate and strong claims. A visual analogy has weak evidential status. A morphological description identifying specific features has intermediate status. Morphometric confirmation provides stronger evidence. Statistical robustness across a sample provides still stronger evidence. The strongest status would require agreement among morphological analysis, a numerical model and experimental data. The concept of the Matrix would then no longer be used in the same way for every observation. Every claim would receive its own degree of rigour.

For clarity, it is also useful to distinguish among the ‘Matrix-as-idea’, ‘Matrix-as-model’ and ‘Matrix-as-method’. The Matrix-as-idea is the philosophical proposition that form-generating principles recur. The Matrix-as-model is a specific scheme, such as A–B–C–D, an L-system, a fractal iteration or an opening model. The Matrix-as-method is an approach to analysing images through features, profiles, databases, morphometry and statistics. If these three meanings are conflated, the term becomes unclear. If they are distinguished, the hypothesis becomes multilayered but manageable.

This distinction is particularly important to the reader. The reader should understand when the author is speaking philosophically, methodologically, descriptively or experimentally. Otherwise, the text may create the impression that the same word is being used alternately as an image, evidence, cause and method. This reduces confidence in the argument. Conversely, if the author explicitly indicates the levels of usage, the reader can see that the hypothesis recognises its own complexity and maintains control over its language.

The risk of indeterminacy in the concept of the Matrix is also relevant to future criticism. A critic may state: ‘The Matrix has not been defined, and the hypothesis is therefore unclear.’ The best response is not to defend vagueness, but to acknowledge the need for a rigorous definition. Indeed, recognising this risk strengthens the study. It demonstrates that the author understands that the central concept requires refinement, delimitation and operationalisation. This makes the hypothesis open to further development. Concepts within a scientific programme are often clarified gradually. What matters is not that a term should be absolutely complete from the first page, but that it should not remain uncontrolled.

The further development of the hypothesis therefore requires the creation of a dedicated glossary of the Matrix. It should specify the principal terms, their working definitions, visual examples, measurable parameters, levels of application and limitations. The concept of the Matrix should be the central term of this glossary. Its definition should be concise but sufficiently rigorous. Related concepts should be presented alongside it: structural invariant, morphological profile, morphogenetic axis, active edge, closed potentiality, opened form, centre–periphery

organisation, axial-network type, radial-layered structure and A–B–C–D. Such a glossary would help stabilise the language of the study.

A practical criterion for using the term may also be proposed. The word ‘Matrix’ should be used only when the analysis concerns not a single feature, but a system of relationships. If an object possesses only a circular outline, for example, it should not immediately be described in terms of the Matrix. If it possesses a centre, layers, an active edge, a transition from the closed to the opened or a connection with a new centre, it may be described as corresponding to a particular type of the Matrix. If an object possesses an axis, branching, a hierarchy of nodes and an active periphery, it may be described as an axial-network manifestation of the Matrix. This practice would make the term more precise.

Visual diagrams may also reduce indeterminacy. A diagram might represent the Matrix not as a single symbol, but as a system of interconnected features: centre, axis, layer, branching, edge, opening, self-similarity and cycle. Such a diagram would demonstrate that the Matrix is not a mystical sign, but an analytical network of concepts. Another diagram might present its levels: visual, morphometric, generative and philosophical. This would help prevent readers from conflating the different ways in which the term is used.

It is important to emphasise that a rigorous definition does not destroy the scale of the idea. On the contrary, it makes that scale manageable. The clearer the concept of the Matrix becomes, the more freely it can be applied to different objects. If the term remains indeterminate, every new example introduces a risk of arbitrariness. If it is defined, new examples can be evaluated: whether they fit the concept, to which type they belong, how strongly they correspond and according to which features. Delimiting the concept therefore does not narrow the hypothesis, but makes it capable of development.

Ultimately, the indeterminacy of the concept of the ‘Matrix’ is not a secondary problem, but one of the central challenges facing the entire study. The hypothesis can be strong only if its key term is not a vague symbol. The Matrix must be defined as a structural logic, a complex of morphological invariants and a model of morphogenetic transitions. It must not become an undefined force, universal cause, hidden intelligence or word for every similarity. Only then can the hypothesis remain philosophically significant while also being methodologically responsible.

Thus, the risk of indeterminacy in the concept of the ‘Matrix’ lies in the possibility that the central term of the hypothesis may become excessively broad, vague and unfalsifiable. To avoid this, the Matrix must be defined as a structural logic of form rather than as a mystical force or universal cause. It should designate a system of recurring morphological invariants and transitions that can be described through the centre, axis, layers, branching, active edge, opening, self-similarity and cyclicity. Such a definition preserves the scale of the hypothesis while making its language more rigorous, testable and open to criticism.

26.4. The Risk of Cultural Overinterpretation

The fourth important risk facing the hypothesis of the Unified Matrix of the Universe is that of cultural overinterpretation. This occurs when artefacts, bas-reliefs, ornaments, sacred diagrams, mythological images, ancient symbols or ritual objects begin to be interpreted exclusively through the author’s morphological scheme without sufficient consideration of their

archaeological, historical, religious, artistic and social contexts. This is particularly dangerous because cultural material is always multilayered. The same sign may possess compositional, ritual, political, mythological, decorative, technological and symbolic meanings. If it is reduced solely to the Matrix, the study will lose its historical precision.

Cultural forms genuinely occupy an important place in this book. The World Tree, lotus, circle, star, spiral, staff, wave, zigzag, bas-relief, artefact, Sri Yantra, mandala and ornamental structures may be considered visual records of persistent morphological relationships. They often contain a centre, axis, layers, symmetry, branching, opening, active edge, repetition and a transition from the hidden to the manifested. This is precisely why they are relevant to the hypothesis. The morphological interest of a form, however, does not mean that it can be removed from its cultural environment and used as direct evidence of a universal Matrix. A cultural object must first be understood as a cultural object.

The principal methodological error of overinterpretation lies in retrospectively imposing a modern scheme upon ancient material. A researcher sees a circle, crescent, star, staff, plant or wave on a bas-relief and immediately interprets them as stages of a morphogenetic process. Such an interpretation may be productive as the author's morphological reading, but it must not be presented as the original meaning of the artefact. For its ancient creator, these elements may have been connected with a deity, authority, a calendar, ritual, astronomical observation, mythology, fertility, water, royal symbolism, decorative tradition or a local artistic canon. Without historical analysis, it is impossible to claim that the object consciously encoded the Matrix.

Particular caution is required when approaching Sumerian, Mesopotamian, Egyptian, Indian, Iranian, Classical, Slavic, Siberian, Central Asian and other ancient images. The older the object, the greater the risk of projecting a modern meaning onto it. We do not always know the full context of its creation, its function, audience, ritual purpose, local semantics, workshop tradition or history of subsequent use. Every morphological interpretation must therefore include a qualification: it does not replace archaeological and historical-cultural interpretation, but proposes an additional level of formal analysis.

In this respect, three levels of engagement with an artefact must be distinguished:

- level 1 — historical and archaeological. This addresses the following questions: where was the object found, when does it date from, what material was it made from, within which culture was it created, what was its function, and how does it relate to comparable objects?
- level 2 — iconographic and symbolic. This analyses images, signs, figures, compositions, and mythological and religious meanings;
- level 3 — morphological. This examines the form as a system of centres, axes, layers, branching, waves, edges, opening, symmetry and repetition.

The hypothesis of the Matrix operates primarily at the third level, but it has no right to disregard the first two.

When these levels are conflated, overinterpretation occurs. If a staff on a bas-relief is interpreted as an 'axis of morphogenesis', this may constitute an interesting morphological observation. Historically, however, the staff may have symbolised power, divine status, ritual action or royal authority. The morphogenetic axis does not invalidate these meanings. It merely indicates that the staff may perform an axial organisational role within the composition. Such a formulation is appropriate. It would be inappropriate to claim that the staff 'actually' signifies only a morphogenetic axis and that all historical interpretations are secondary or mistaken.

The same applies to the circle, crescent and star. Within the hypothesis, they may be considered a sequence of closed form, transitional opening and radial manifestation. Within a specific culture, however, these signs may have possessed astronomical, religious, calendrical, political or mythological meanings. A morphological reading may be superimposed upon this system as an additional analytical layer, but it must not claim the status of a definitive decipherment. Otherwise, the hypothesis begins to resemble an attempt to replace historical scholarship with a universal interpretative key.

The formulation ‘the ancients knew’ is particularly dangerous. It frequently appears in pseudoscientific and mystifying interpretations of cultural heritage. If an ancient artefact resembles a modern scheme, it is concluded that ancient peoples possessed hidden knowledge of the cosmos, genetics, fractals, morphogenesis or the universal structure of the Universe. Such a conclusion must be avoided within the present study. Ancient cultures may indeed have possessed acute powers of observation, highly developed symbolism and complex visual systems. The claim that they possessed direct knowledge of a modern morphogenetic Matrix, however, requires evidence that is generally absent. It is more accurate to state that a cultural form may be compared with a morphological scheme, but that this does not imply the direct historical transmission of scientific knowledge.

Cultural overinterpretation is also dangerous because it impoverishes culture itself. If every ornament is read solely as a manifestation of the Matrix, its local specificity disappears: its style, technique, material, school, religious function, social role, aesthetic canon and historical situation. The artefact becomes an illustration of an external idea. This does an injustice to cultural heritage. A sound interpretation should not absorb the object, but reveal its multilayered character. The Matrix may constitute one level of interpretation, but it must not become the only one.

The World Tree, for example, possesses many meanings in different cultures. It may be a cosmological axis, ancestral symbol, shamanic structure for passage between worlds, image of fertility, genealogical scheme, origin myth, ritual sign, or architectural or ornamental composition. Within the hypothesis of the Matrix, it is regarded as a universal model of growth, axis, root, trunk, branches and connections among levels. This is a productive morphological reading. It must not, however, erase the differences among the Norse Yggdrasil, Indian Ashvattha, Mesopotamian sacred tree, Siberian shamanic tree and Mayan ceiba. Shared morphology does not eliminate cultural specificity.

The same applies to the lotus. The lotus may be a biological object, a symbol of purity, birth, spiritual opening, cosmic order or a divine throne; it may constitute a mandala-like structure, decorative motif or architectural form. Within the hypothesis, it is important as a cultural model of opening. If it is considered solely as a ‘scheme of the Matrix’, however, its religious, artistic and historical meanings will be lost. An appropriate formulation must therefore remain cautious: in different traditions, the lotus may be regarded as a culturally rich image of opening that also permits a morphological interpretation within the hypothesis of the Matrix.

Sacred geometry occupies a special position. Geometric structures such as mandalas, yantras, circles, squares, triangles, stars and nested forms possess a high degree of morphological expressiveness. They may indeed be analysed through centres, layers, symmetry, boundaries, repetition and movement from the centre towards the periphery. Sacred geometry, however, forms part of specific spiritual and cultural systems. It cannot be transformed into a universal scheme without context. The Sri Yantra, for example, possesses its own place within Hindu and

Tantric traditions. Morphological analysis of its structure is possible, but it does not replace an understanding grounded in religious studies and history.

Crop circles also require caution, although they belong not to ancient cultures, but to a modern visual phenomenon. They may be analysed as landscape-scale geometric compositions: centre, radiality, chains of circles, spirals, active edges, scale and visual legibility from above. They cannot, however, be used as cultural or cosmic evidence of the Matrix without analysing their origin, authorship, technology, context and possible mystification. The risk of overinterpretation is particularly high in this field because visual complexity readily provokes supernatural conclusions.

Cultural overinterpretation frequently arises from the desire to discover a universal key to all symbols. Symbols, however, do not function as simple ciphers. Their meanings change over time and depend upon context, ritual, language, social structure, power, material, artistic canon and perception. The same sign may possess different meanings in different cultures. Moreover, a single object may simultaneously contain several levels of meaning. The hypothesis of the Matrix should therefore not claim to decipher cultural symbols with final authority. It may propose an additional morphological level of interpretation, but not a definitive semantics.

Several rules must be observed to reduce the risk of overinterpretation. First, every cultural object must initially be described within its historical and archaeological context. Second, morphological interpretation should be introduced only after that description. Third, established knowledge must be clearly distinguished from the author's hypothesis. Fourth, the original intention of an ancient creator must not be asserted without evidence. Fifth, alternative interpretations must be considered. Sixth, it must be acknowledged that a morphological similarity may be accidental, decorative or produced by a shared aesthetic logic rather than by profound knowledge of the Matrix.

Cautious formulations are especially important. Instead of writing 'the bas-relief depicts the stages of the Matrix', it would be better to state: 'Within the author's morphological interpretation, the bas-relief may be regarded as a composition permitting comparison with the stages A–B–C–D.' Instead of 'the ancient ornament proves knowledge of a universal code', one should write: 'The ornament exhibits centred-layered organisation that may be compared with other radial structures.' Instead of 'the Sri Yantra is a scheme of the Matrix', one should state: 'The structure of the Sri Yantra permits a morphological analysis of its centre, nesting and boundaries.' Such language preserves the idea while protecting it against excessive conclusions.

Cultural material should also be incorporated into the database separately from natural material. Within the BIO–GEO–COS–CULT–EXP corpus, the CULT block should possess its own fields: culture, date, region, material, function, iconography, established interpretations, image source, degree of reconstruction, state of preservation, morphological features and analytical limitations. A cultural artefact cannot be treated as if it possessed the same status as a natural object. Cultural objects have authorship, tradition and a semantic environment. Their morphological profiles must therefore be expanded to include historical and cultural information.

The technological factor must also be considered. The form of an artefact frequently depends not only upon symbolism, but also upon its material and method of production. Stone, clay, metal, wood, fabric, ceramics, relief work, carving, embossing, painting, weaving, embroidery and architectural masonry all constrain and direct form. A zigzag may be not only a symbol of water or movement, but also a convenient ornamental device. A circle may be connected with rotational techniques, a vessel, wheel, seal or the composition of a surface. Symmetry may arise

from technological repetition. If material and technique are disregarded, morphological interpretation becomes excessively abstract.

Social context is equally important. An artefact may have functioned as an object of power, ritual, everyday life, funerary practice, trade, craftsmanship, status or instruction. Its form may have been intended for a viewer, participant in a ritual, owner, community, deity, deceased person or ruler. A morphological scheme must not erase these functions. A central axis within a composition, for example, may represent not only a morphogenetic axis, but also power, hierarchy, divine order or ritual direction. These meanings may coexist, but they cannot be replaced by a single authorial explanation.

The risk of overinterpretation is also connected with the modern visual processing of images. Many artefacts are known to us through photographs, museum displays, drawings, reconstructions, digital restorations or popular images. Modern processing sometimes intensifies symmetry, contrast, contours or compositional clarity. If a researcher works not with the primary object, but with a processed image, they may mistake the characteristics of the visualisation for properties of the artefact. The image source must therefore be identified and the degree of reconstruction taken into account. This is especially important for ancient bas-reliefs, damaged objects and archaeological reconstructions.

Cultural overinterpretation may be reduced through collaboration with specialists. Archaeologists, art historians, scholars of religion, cultural historians and regional specialists can identify errors, anachronisms, simplifications and alternative meanings. For the hypothesis of the Matrix, such dialogue is not a threat, but a necessity. If a morphological reading withstands engagement with historical and cultural expertise, it becomes stronger. If it does not, it must be reconsidered. Interdisciplinarity must not mean treating material from other disciplines freely; it requires respect for disciplinary expertise.

An important principle is the rejection of any monopoly over meaning. An artefact may simultaneously be an object belonging to a particular culture and an object of general morphology. These levels are not mutually exclusive. A bas-relief, for example, may possess a religious subject, political function and artistic style while also exhibiting a centred, axial or sequential composition. Morphological analysis can describe its form without claiming to provide a complete decipherment of its meaning. Such a position makes the hypothesis more mature. It does not appropriate the cultural object, but adds another analytical layer to it.

It is especially important to acknowledge that cultural forms may deliberately stylise nature. Humans frequently transfer natural structures into ornament: leaves, flowers, branches, waves, stars, animal forms, trees, seeds, fruit, water and the Sun. The similarity of a cultural motif to a natural form does not therefore always require a hypothesis concerning a profound Matrix. It may represent nature directly, constitute a decorative stylisation, follow an artisanal tradition or symbolise fertility. The hypothesis of the Matrix becomes substantive only when the analysis proceeds beyond the obvious motif and demonstrates the structural organisation of the form.

If an ornament depicts a flower, for example, its floral character alone does not constitute a strong argument. If the ornament also possesses a centre, multiple layers, an active edge, nesting, a transition to new modules and connections with other morphological types, it may then be incorporated into the analysis. The same applies to the tree: an image of a tree does not in itself prove a universal model of growth. Its composition—root, trunk, branches, levels, fruit and connections between upper and lower regions—may, however, be considered a cultural record of axial-network morphology.

In the future, a scale of interpretative caution for cultural material could be developed. The first level would consist of an established cultural meaning confirmed by sources and specialists. The second would be a probable iconographic interpretation. The third would be a morphological description without claims concerning meaning. The fourth would be the author's hypothetical interpretation within the framework of the Matrix. The fifth would be a philosophical generalisation. If these levels are identified explicitly, the reader will understand where historical knowledge ends and the author's hypothesis begins. This would protect the study against accusations of arbitrarily interpreting artefacts.

Cultural overinterpretation is a serious risk, but cultural material remains extremely valuable when approached appropriately. It demonstrates that human beings do not merely observe the forms of the world, but translate them into signs, images, rituals, ornaments, architecture and symbolic systems. Culture is not simply a mirror of nature, but an independent level of form generation. It reworks natural structures, intensifies symmetry, idealises growth, transforms dynamics into signs, and connects the biological, cosmic and social. This is precisely why cultural forms are important to the hypothesis. They must nevertheless be studied with respect for their own complexity.

Thus, the risk of cultural overinterpretation lies in the possibility that artefacts, bas-reliefs, ornaments and sacred forms may be prematurely interpreted as direct evidence of the Matrix without consideration of their archaeological, historical, religious and cultural contexts. To avoid this risk, it is necessary to:

1) distinguish among the historical-archaeological, iconographic and morphological levels of analysis, and use cautious formulations;
2) consider material, technique, function and tradition;
3) avoid attributing modern knowledge to ancient cultures without evidence;
4) treat morphological interpretation as an additional rather than exclusive layer of meaning.

Only then can cultural material strengthen the hypothesis without transforming it into an arbitrary system of decipherment.

26.5. The Problem of Provability

The fifth and most general weakness of the hypothesis of the Unified Matrix of the Universe is the problem of provability. Having considered the risks of excessive analogising, mystification, indeterminacy in the concept of the Matrix and cultural overinterpretation, it must be acknowledged directly that the present hypothesis is still at the stage of conceptual and methodological development. It proposes a broad perspective on the recurrence of morphological structures in nature, culture and modelling, but it is not yet a completed scientific theory in the strict sense. Its principal propositions require further testing, refinement, formalisation and critical discussion.

This acknowledgement does not weaken the study; it makes it intellectually honest. Every new hypothesis passes through a stage of preliminary development. First comes an observation: certain forms appear similar. A descriptive language is then established: centre, axis, layer, branching, active edge, opening, fractality and structural invariant. Comparative material is subsequently assembled: biological, geological, cosmological, cultural and experimental

objects. Methods of testing are then developed: morphometry, fractal analysis, graph analysis, numerical modelling, statistics and computer vision. Only after this can the hypothesis progress towards a more rigorous scientific status. The present book stands precisely at the boundary between a conceptual construction and a future research programme.

The problem of provability arises primarily because the hypothesis has an extremely broad subject. It is not restricted to a single type of object, discipline or scale. It addresses leaves, flowers, seeds, mycelia, corals, river networks, coastlines, faults, craters, nebulae, galaxies, artefacts, ornaments, sacred diagrams and numerical models. Such breadth makes the hypothesis substantial and attractive, but simultaneously complicates its testing. The universality of the Matrix cannot be demonstrated through one example, one illustration or one beautiful triad. An entire system of tests is required.

The principal difficulty lies in the fact that different levels of reality possess different mechanisms of formation. Biological forms arise through living growth, cellular processes, genetic regulation, mechanical stresses and interaction with the environment. Geological forms arise through tectonics, erosion, sedimentation, volcanism, gravity, water flows and prolonged geological time. Cosmological structures are connected with gravity, gas dynamics, radiation, stellar evolution and the distribution of matter. Cultural forms are created by humans within historical, symbolic and technological systems. It cannot therefore be expected that a single simple test will confirm the entire hypothesis.

It is more appropriate to discuss the provability of individual levels and claims. It can be tested whether particular features of form genuinely recur across different classes of objects. It can be tested whether the author's BIO–GEO–COS triads differ from random comparisons, whether stable morphological clusters exist, whether numerical models reproduce certain types of patterns, and how closely the morphological features of cultural artefacts correspond to natural structures. All of these, however, would constitute partial tests. They may strengthen, refine or limit the hypothesis, but they do not immediately transform it into a conclusively proven universal theory.

Different degrees of evidential strength must therefore be distinguished. Weak evidence arises at the level of visual similarity. It is important for posing the question, but insufficient for drawing a conclusion. Moderate evidence emerges when similarity has been described through specific features and supported by morphological analysis. Stronger evidence requires measurements, statistics, control samples, reproducible algorithms and independent verification. The highest level becomes possible when morphometry, numerical modelling, experimental data and statistical analysis agree. At present, many parts of the hypothesis of the Matrix lie between the first and second levels; its future task is to progress towards the third and fourth.

It is especially important not to confuse persuasiveness with proof. A hypothesis may be visually persuasive, philosophically expressive and methodologically promising while remaining unproven. This is a normal state for a concept under development. A problem arises only when the author or reader mistakes the strength of an impression for the strength of evidence. This distinction must be maintained consistently throughout the book: images demonstrate the possibility of a question; terminology creates a language; formalisation proposes a means of testing; but conclusive evidential support requires a separate programme of research.

The problem of provability is also connected with the fact that the concept of the Matrix encompasses different levels. If the Matrix is understood philosophically as the idea that structural principles recur, it cannot be proven in the same manner as a specific physical

regularity. If it is understood methodologically as a system of features, it can be tested through morphometry. If it is understood generatively as a set of rules producing forms, it can be tested through numerical modelling and experimentation. If it is understood culturally as a scheme for recording images, it can be discussed through cultural history and iconography. The question ‘Has the Matrix been proven?’ is therefore excessively general. It is more appropriate to ask which level of the hypothesis is being tested and by which means.

The scientific development of the hypothesis requires the formulation of testable propositions. For example: certain biological, geological and cosmological objects exhibit similar morphological profiles according to features of the centre, layers and active edge. Or: branching structures at different levels may be compared through graph parameters. Or: the author’s triads have a smaller morphological distance than randomly constructed triads. Or: the A–B–C–D model may be expressed through parameters of closure, opening, layering, branching and the appearance of a new centre. Such propositions can be tested. The more testable formulations of this kind are developed, the stronger the hypothesis will become.

At the same time, it is necessary to determine which propositions are not currently testable. It cannot be rigorously demonstrated, for example, that every form in the Universe originates from a single universal Matrix if the Matrix is understood as an ultimate philosophical principle. A small number of artefacts cannot prove that ancient cultures consciously knew a universal scheme of morphogenesis. A visual resemblance between a flower and a nebula cannot prove a causal relationship between them. The presence of spirals in different systems cannot establish a single shared mechanism. Such propositions may be philosophical, heuristic or metaphorical, but they must not be presented as proven.

An honest acknowledgement of the limits of provability is especially important to confidence in the book. The reader must see that the author is not attempting to present the hypothesis as an already established law. On the contrary, it is presented as a developing research programme requiring further testing. This approach is far stronger than a categorical assertion of universality. Scientific culture requires not only bold ideas, but also a willingness to identify where an idea remains unproven, what data are required, which methods must be applied and which results could refute or limit it.

One criterion of the hypothesis’s maturity is the falsifiability of its individual components. If the hypothesis is constructed in such a way that every observation is declared confirmatory, it loses scientific value. It is therefore necessary to specify which results could weaken it. If morphometric analysis demonstrates that the author’s triads do not differ from random ones, their argumentative force will be reduced. If fractal analysis does not confirm the scale-dependent complexity of the proposed objects, the relevant analogies must be reconsidered. If computer vision does not identify stable cross-level clusters, the claim of strong morphological proximity will have to be limited. If cultural expertise demonstrates that certain interpretations of artefacts are anachronistic, they must be removed or reformulated.

The possibility of weakening the hypothesis does not destroy it; it makes it testable. A strong research programme must permit partial negative results. Such results help refine its area of applicability. The hypothesis may prove strong for axial-network and radial-layered forms but weak for other classes of objects. It may function effectively as a language of comparative morphology without being confirmed as a universal generative model. Cultural forms may prove valuable as illustrative and philosophical material, but not as rigorous evidence. Such refinements do not constitute defeat. They transform a broad idea into a more precise system.

The problem of provability also requires a distinction between evidence and interpretation. Evidence concerns testable features, measurements, statistical results, reproducible models and experimental data. Interpretation concerns the meaning of these results, their philosophical significance and their place within an overall picture of the world. Even if certain forms are shown to possess genuinely similar morphological profiles, this will not automatically prove the philosophical Matrix. It will provide an empirical foundation for a subsequent philosophical conclusion. The transition from data to philosophy must be cautious and explicitly identified.

The scale of evidence is especially important. A universal hypothesis requires not a single confirmation, but numerous independent lines of support: biological data must be tested separately, geological data separately, cosmological data separately, cultural material separately and numerical models separately. It is then necessary to determine whether the results converge. If different lines of analysis independently demonstrate the recurrence of certain structural invariants, the hypothesis receives substantial support. If support is found in only one field, its universal status must be restricted. Future testing must therefore be multistage.

A possible testing programme might include the following stages:

- stage 1—creating a precise glossary and morphological profile;
- stage 2—constructing a BIO–GEO–COS–CULT–EXP image database specifying sources, scales and contexts;
- stage 3—manual and expert annotation of features;
- stage 4—morphometric, fractal and graph analysis;
- stage 5—constructing morphological vectors and clusters;
- stage 6—comparing the author's triads with random and control samples;
- stage 7—numerical modelling of individual types of forms;
- stage 8—experimental testing in chemical and biological systems;
- stage 9—independent evaluation by specialists from different disciplines.

Only such a sequence can gradually strengthen the evidential status of the hypothesis.

It is important to understand that proof in this case does not necessarily have to take the form of one final conclusion. The hypothesis may be partially supported, refined, divided into several narrower hypotheses or transformed into a method of comparative morphology. The idea of the Unified Matrix may prove too broad as an ontological claim but extremely useful as a method for describing structural invariants. The A–B–C–D model may work for biological and cultural forms while being less applicable to certain geophysical objects. The term 'active edge' may prove especially productive for analysing natural and experimental patterns. Such results would remain scientifically valuable even without complete confirmation of the entire hypothesis.

The problem of provability is particularly acute in relation to the word 'unified'. If the unity of the Matrix is asserted, it must be explained in what sense this unity is understood. If it means the same mechanism for every form, the claim will most likely be impossible to defend. If it means that certain morphological relationships recur under different mechanisms, this is a considerably more defensible position. If it means a shared language for describing form, it is a methodological claim. If it means a philosophical experience of the structural connectedness of the world, it belongs to a different level. Provability therefore depends upon how precisely unity itself is defined.

The most robust formulation in the present book appears to be the cautious proposition that the hypothesis assumes not an identity of causes, but the recurrence of structural invariants of form

at different levels. This formulation does not require the impossible demonstration of a single mechanism shared by a flower, river, nebula and ornament. It requires testing whether certain relationships of form genuinely recur with sufficient frequency, stability and measurability. This makes the hypothesis more open to evidential support. The less it claims to provide an absolute explanation, the greater its chances of becoming an object of serious research.

It must also be acknowledged that part of the evidential strength will depend upon the quality of the data. Cosmological images are frequently the result of complex processing. Geological data depend upon scale, resolution and mapping method. Biological images depend upon species, stage of development, growth conditions and imaging technique. Cultural images depend upon the preservation of the artefact, reconstruction and interpretation. Experimental data depend upon environmental parameters. Testing the hypothesis therefore requires not merely beautiful images, but rigorous documentation of their sources. Without this, its evidential basis will remain weak.

The problem of provability is also connected with the reproducibility of results. If another researcher cannot obtain a similar result using the same data and methods, the hypothesis remains subjective. Future studies must therefore be reproducible: open image databases, documented algorithms, transparent parameters, accessible annotation protocols and independent verification. This is especially important for computer vision and machine learning. An algorithm must not function as a black box producing an impressive classification without explanation. Its results must be testable and interpretable.

It must also be acknowledged that the provability of a philosophical hypothesis always differs from that of a specific empirical regularity. A philosophical hypothesis may be strong if it organises material, proposes a productive language, formulates new questions, connects data from different fields and permits partial testing. It may be weak if it remains merely a beautiful metaphor. The purpose of the present study is to move the hypothesis from the realm of metaphor into that of an organised research programme. Complete proof may be a task for future work, but methodological soundness must be established now.

An honest acknowledgement of the problem of provability also helps prevent inflated expectations. This book should not claim to have conclusively revealed a law of the Universe. A more accurate position is that it proposes a hypothesis concerning possible morphological invariants, assembles visual and conceptual material, introduces terminology, outlines methods of formalisation and identifies directions for testing. This status is sufficiently strong. Not every book must complete an investigation; some studies open up a new field of inquiry. In the present case, this is the principal task.

It is also important to demonstrate that future testing may proceed cumulatively. No single result will resolve the question. Numerous partial results, however, may gradually alter the status of the hypothesis. If different types of data demonstrate stable structural recurrences; if numerical models reproduce the principal morphological types; if statistics confirm that certain analogies are non-random; if computer vision identifies cross-level clusters; and if cultural interpretations remain consistent with their historical contexts, the hypothesis will become considerably stronger. If this does not occur, it must be reconsidered.

The problem of provability is therefore not an insurmountable obstacle, but it requires rigour. The hypothesis of the Matrix must be a programme rather than a dogma. It must develop through the refinement of concepts, the testing of features, the acknowledgement of limitations, the rejection of weak analogies and the accumulation of data. Only in this form will it be able to withstand

scientific criticism. If it is instead presented as an already proven universal truth, it will become vulnerable and lose credibility.

The risks and weaknesses of the hypothesis of the Unified Matrix of the Universe are connected primarily with excessive analogising, mystification, indeterminacy in the concept of the Matrix, cultural overinterpretation and the problem of provability. All these risks are serious, but they do not invalidate the hypothesis. On the contrary, acknowledging them honestly establishes the conditions for its further development. The hypothesis must avoid replacing visual similarity with causal connection, resist becoming a mystical system, define its central concept rigorously, respect the cultural context of artefacts and openly acknowledge its current status. At the present stage, it is a conceptually developed and methodologically promising research programme requiring further testing through morphometry, fractal analysis, numerical modelling, statistics, computer vision and interdisciplinary evaluation.

Chapter Twenty-Seven

A Scientific Programme for Further Research

27.1. Creating an Atlas of Morphogenetic Forms

The first direction of further research within the hypothesis of the Unified Matrix of the Universe should be the creation of an atlas of morphogenetic forms. Following the examination of the hypothesis's strengths, risks and methodological limitations in the preceding chapters, it has become evident that the project cannot develop further solely through individual examples, visual comparisons and authorial interpretations. A systematic corpus of images is required, organised according to rigorous categories and accompanied by consistent descriptive parameters. Such an atlas should become not an illustrative supplement, but a research database.

An atlas of morphogenetic forms may be understood as a structured collection of images depicting objects in which different types of form generation are manifested: closed potentiality, opening, branching, layering, radiality, active edges, spirality, shell-like organisation, fractal complexity, axial organisation and transitions from one stage to another. Unlike an ordinary visual album, such an atlas should record not only the beauty or expressiveness of a form, but also its analytical status. Every image should be incorporated into a system: the level to which it belongs, the features observed within it, the morphological type it represents and its suitability for subsequent measurement.

The principal categories of the atlas may include the seed, bud, flower, leaf, stone, relief, ocean floor, nebula, galaxy and artefact. This list is important not because it exhausts every possible form, but because it encompasses several fundamentally different levels: biological, geological, hydrogeological, cosmological and cultural. The seed, bud, flower and leaf represent living morphogenesis. Stone, relief and the ocean floor represent forms of non-living terrestrial matter. The nebula and galaxy extend the analysis to the cosmic scale. The artefact introduces human culture as a distinct level at which form is recorded and reworked.

The seed category should become one of the atlas's foundations because the seed embodies closed potentiality. It is compact and enclosed within a shell, relatively simple externally, yet contains the possibility of future unfolding. The atlas may include images of seeds from different plants: smooth, grooved, winged, spherical, elongated, spiral, multilayered, and those with a pronounced shell or embryonic structure. For the hypothesis of the Matrix, the seed is important as the initial form of stage A: the form has not yet opened, but is already organised as the potential centre of future growth.

The bud category continues this sequence, but already demonstrates the tension of transition. The bud is an intermediate form between closure and opening. Its significant features include the shell, fold, internal layering, direction of growth, compressed symmetry, line of future opening and active edges of the sepals and petals. Within the atlas, buds should be presented not merely as beautiful biological objects, but as models of morphological transition. Image sequences

showing the same bud over time—from a closed state through partial opening to a fully opened flower—would be especially valuable.

The flower category should represent the radial-layered and centrally organised type of form. A flower generally displays a clearly visible centre, petal layers, radiality, symmetry or asymmetry, an active edge, the transition from bud to opened structure and subsequently to fruiting and a new seed. The atlas should include different types of flowers: simple, many-petalled, spirally organised, asymmetrical, tubular, rosette-like, umbellate and lotus-like. This would avoid the illusion that all flowers correspond to a single ideal scheme. The atlas must demonstrate diversity within one morphological family.

The leaf category is important for analysing the axial-network type. A leaf possesses a midrib, lateral branching, an edge, a surface of distribution, symmetry or asymmetry, different types of venation and different contour shapes. The atlas should include leaves with pinnate, palmate, parallel, reticulate, arcuate and complex venation. Images revealing not only the external form of the leaf, but also its internal network of veins, are especially important. The leaf makes it possible to analyse the relationship among axis, network and edge, and to compare biological branching with river, vascular, fracture and filamentary structures.

The stone category should be included not as a simple collection of mineral images, but as material for analysing closed, layered, shell-like and internally structured forms. Stones, geodes, crystals, minerals, pebbles, rock sections and structures containing veins, rings, cracks and inclusions can demonstrate that non-living matter also possesses complex morphology. Objects whose outer shell conceals an internal structure are particularly important: geodes, agates, mineral sections and stones with concentric layers or crystalline cavities. These may be compared with the themes of closed potentiality and internal opening, but without biologising the stone.

The relief category should represent the terrestrial surface as a field of morphogenesis. It may include mountain systems, valleys, drainage basins, ravines, folded structures, volcanic forms, craters, deltas, coastlines, glacial traces, desert dunes and erosional systems. Images derived from satellite observations, digital elevation models and relief maps are especially important to the atlas. Relief makes it possible to analyse axes, branching, layers, edges, gradients, fronts of destruction and accumulation, and the scale-dependent complexity of the terrestrial surface.

The ocean-floor category is especially promising because it extends the geological block beyond visible land. The ocean floor contains mid-ocean ridges, faults, deep-sea trenches, submarine volcanoes, abyssal plains, canyons, rift zones, sedimentary structures and traces of tectonic activity. These forms are often hidden from direct view and become visible only through bathymetric maps, geophysical models and digital visualisations. This is important to the hypothesis of the Matrix because form appears here not as a familiar landscape, but as a reconstructed structure of the Earth’s crust.

Within the atlas, the ocean floor may become a distinctive bridge between geology and cosmology. Its maps frequently show fault lines, ridges, radial volcanic structures, island chains, fracture fields, layered sedimentary regions and active plate edges. These forms may be compared with terrestrial relief, fracture networks, filamentary structures and models of opening, but again only at the morphological level. Biological or cultural meanings must not be transferred to the ocean floor. It should be treated as an independent geophysical level.

The nebula category should include cosmological objects in which shells, filaments, active edges, central sources, asymmetry, layers, gas and dust structures, and regions of star formation are visible. It is important to use images with clearly identified origins: telescope, observational waveband, processing method, scale, object and scientific description. Nebulae are especially visually attractive, so the atlas must avoid selecting only the most ‘flower-like’ or ‘symbolic’ objects. It should include different types of nebulae: planetary, emission and reflection nebulae, supernova remnants and regions of molecular clouds. This would make it possible to evaluate which morphological features are genuinely robust.

The galaxy category should represent another cosmological level. It should include spiral, elliptical, irregular, barred and ring galaxies, interacting galaxies and galaxy clusters. Spiral galaxies may be important for analysing centres, discs, arms, rotational organisation and asymmetry. Elliptical and irregular galaxies are required as controls so that the entire cosmos is not reduced to a beautiful spiral. The atlas must present not only confirmatory forms, but also problematic ones. Only then will it become scientific rather than a selectively assembled collection of illustrations.

The artefact category should include cultural objects, but with particular methodological caution. It may encompass ornaments, bas-reliefs, vessels, seals, ritual objects, sacred diagrams, architectural plans, mandalas and depictions of trees, lotuses, stars, waves, spirals and geometric structures. Every artefact should be accompanied by information concerning its culture, date, region, material, function, established interpretation and image source. The morphological reading must be separated from the historical-cultural description. An artefact within the atlas should not become ‘evidence of the Matrix’ in itself; it should be an object within the comparative morphology of culture.

The structure of the atlas should be multilayered. At the first level, images would be distributed among the principal blocks: BIO, GEO, OCEAN, COS, CULT and EXP. At the second level, they would be divided according to types of form: closed, opening, radial-layered, axial-network, spiral, fractal-edged, folded, shell-like, branching, concentric and labyrinthine. At the third level, every object would be assigned a morphological profile. At the fourth level, objects could be compared parametrically. Such a structure would prevent the atlas from becoming a chaotic collection of beautiful images.

Every image within the atlas should possess a rigorous record. It should specify the object’s name, category, source, scale, method of image acquisition, date or period in the case of a cultural object, data type, image quality, degree of processing, principal morphological features, possible limitations, level of interpretation and relationship to the A–B–C–D model. For a biological object, the species, stage of development and imaging conditions should be recorded; for a geological object, the region, scale, data type and source of the map or image; for a cosmological object, the object, telescope, observational waveband and visualisation method; and for a cultural object, its context and established interpretations.

It is especially important to distinguish real data from illustrative images. The atlas may contain different types of visual material: photographs, micrographs, satellite images, digital elevation models, bathymetric maps, telescopic images, archaeological photographs, museum images, drawings, diagrams, numerical models and authorial illustrations. Their status must not, however, remain unspecified. A real photograph of a flower, a generated model of opening and an artistic diagram of a lotus possess different evidential weight. The atlas must record these distinctions.

A pilot atlas could be created during the initial stage. It might contain a limited number of objects—for example, 20–30 images within each category: seeds, buds, flowers, leaves, stones, relief, ocean floors, nebulae, galaxies and artefacts. Such a volume would already make it possible to determine which features recur, which categories are excessively heterogeneous, which images are difficult to analyse, where data are lacking and which parameters require refinement. The pilot atlas should not claim to produce final conclusions. Its purpose would be to test the descriptive methodology itself.

Following the pilot stage, work could proceed towards an expanded atlas containing hundreds and eventually thousands of images. This would require not only manual work, but also a digital database. Images should be stored together with metadata, morphological features and search functions. A researcher should be able to select, for example, all objects possessing a pronounced centre and three or more layers; all branching structures with high fractal complexity; all forms with an active edge; all stage B objects within the A–B–C–D model; or all cultural artefacts possessing an axial composition. Such an atlas would become an instrument of analysis.

Creating the atlas would accomplish several tasks simultaneously. First, it would systematise the research material. Second, it would reduce the risk of subjective example selection. Third, it would establish a foundation for the classifier of invariants discussed in the following section. Fourth, it would permit the application of morphometry and computer vision. Fifth, it would make the hypothesis open to external verification: other researchers would be able to see which objects had been included, which features had been used to describe them and how they had been compared.

The atlas would also help identify the weaknesses of the hypothesis. If a particular category contains few objects possessing the required features, this would constitute an important result. If certain forms resist classification, this would demonstrate the need to refine the terminology. If cultural artefacts prove excessively dependent upon context, their role within the hypothesis would have to be limited. If cosmological images prove highly dependent upon processing, a specific protocol would be required. The atlas is needed not only for confirmation, but also for testing boundaries.

Negative and control images should form an important part of the atlas. Radial-layered flowers, for example, should be accompanied by strongly asymmetrical flowers. Spiral galaxies should be accompanied by elliptical and irregular galaxies. Pronounced river networks should be accompanied by regions of relief without clear branching. Artefacts resembling schemes of opening should be accompanied by artefacts possessing a different compositional logic. This would prevent confirmatory selection. The atlas must demonstrate not only what corresponds to the hypothesis, but also what limits it.

The atlas of morphogenetic forms may also possess educational value. It would allow readers to see how the same terminology is applied to different objects: a seed, bud, leaf, relief, nebula, galaxy and artefact. The atlas could teach readers to perceive form not as an arbitrary image, but as a structure possessing parameters. It could become a visual supplement to the book, an electronic database, an interactive platform or the foundation of a future research project. In this form, the hypothesis would acquire not only a textual, but also a visual and analytical infrastructure.

In the longer term, the atlas could become open and expandable. Different researchers would be able to add new images, refine features, propose alternative classifications, debate the status of

objects and compare results. Such a format is especially important to an interdisciplinary hypothesis. A biologist could add new types of leaves or tissues. A geologist could add relief, faults and bathymetric data. An astronomer could contribute new nebulae and galaxies. A cultural scholar could add artefacts accompanied by context. An AI specialist could add the results of segmentation and clustering. The atlas would then become not a static catalogue, but a developing scientific environment.

Caution would nevertheless be required even during the initial stage. The atlas must not become a visual collection of confirmations. Its purpose is not to prove the hypothesis at any cost, but to create material for testing it. The inclusion criteria must therefore be transparent. It should be stated whether an object has been selected as a strong example, a control example, a negative case, a borderline case or a representative of a particular category. Only under these conditions would the atlas be scientifically honest.

Creating the atlas would also require a consistent visual standard. Images should be of sufficient quality for analysis. Comparable formats should be used wherever possible, scale should be recorded, excessive artistic processing avoided, and the original and processed versions stored separately. Certain objects would require multiple representations: a photograph, contour, diagram, segmented version, graph model, radial profile and fractal analysis. This is especially important for the transition from a visual atlas to a measurement database.

Within the context of the study as a whole, the atlas of morphogenetic forms constitutes the first practical step towards transforming the hypothesis into a research programme. Before the atlas is created, the hypothesis remains largely textual and conceptual. Once it exists, a corpus of data becomes available. It is precisely such a corpus that makes it possible to progress towards classification, formalisation, statistics, machine analysis and expert verification. The atlas is therefore not an additional illustration, but the foundation for the next stage of work.

Thus, creating an atlas of morphogenetic forms is the first priority for the further development of the hypothesis of the Unified Matrix of the Universe. Such an atlas should collect images within the following categories: seed, bud, flower, leaf, stone, relief, ocean floor, nebula, galaxy and artefact. Every image should be accompanied by a morphological profile and data concerning its source, scale, context and formal features. The atlas would systematise the material, reduce the risk of subjective selection, prepare the way for a classifier of invariants and establish a foundation for morphometric, statistical and computer-based analysis. It is with this atlas that the hypothesis can begin its transition from an authorial concept to a testable scientific programme.

27.2. Creating a Classifier of Invariants

The second direction of further research should be the creation of a classifier of invariants. If the atlas of morphogenetic forms collects and systematises images, the classifier must transform this visual material into comparable features. Without such an instrument, the atlas risks remaining merely a large collection of interesting objects. The classifier would make it possible to progress from observation to analysis: to record which morphological elements are present in every image, how strongly they are expressed, how they are combined and to which type of form the object may be assigned.

The classifier of invariants should be constructed around the features gradually identified throughout the study: centre, axis, layers, radiality, edge, spiral, branching, fractality and degree of opening. These features are not arbitrary. Each is connected with one of the principal lines of the hypothesis of the Matrix. The centre indicates the initial point of organisation. The axis establishes the direction of unfolding. Layers demonstrate levels and nesting. Radiality connects the centre with the periphery. The edge records the boundary and zone of interaction. The spiral expresses rotational or unfolding movement. Branching demonstrates the propagation of structure through nodes and branches. Fractality indicates scale-dependent complexity. The degree of opening connects a form with the process of transition from a closed to a manifested state.

The principal task of the classifier is to make these features observable and comparable. It is not sufficient, for example, simply to state that an object ‘has a centre’. It must be specified which kind of centre is present: geometric, compositional, density-based, luminous, growth-related, functional or symbolic. The centre of a flower may be biological and compositional. That of a crater may be geometric and geological. That of a nebula may be luminous, density-based or dynamic. The centre of an artefact may be symbolic or compositional. The classifier must therefore record not only the presence of a centre, but also its type.

The centre may be evaluated according to several parameters: the presence of a central zone, the prominence of the centre, its correspondence with the geometric midpoint, the relationship between centre and periphery, the presence of one or multiple centres, the degree of displacement of the centre and its role in organising the form as a whole. A radial-layered flower, for example, will possess a strong centre around which its petals are organised. A branching river network may possess not a centre, but a principal axis or outlet point. A cosmic filamentary structure may contain numerous nodes without possessing a single centre. This difference must be reflected within the classification.

The second invariant is the axis. An axis may be vertical, horizontal, diagonal, radial, hidden, compositional, geological, biological or process-based. In a tree, the trunk forms the axis. In a leaf, it is the midrib. In a valley, it may be the principal channel or watershed line. In an artefact, it may be a staff, the vertical line of a figure or the central compositional line. In a fold, it is the axis of deformation. In a galaxy with outflows or an elongated nebula, it is the direction of the principal structure. The classifier must record not only the presence of an axis, but also its function: whether it organises branching, divides the form into symmetrical parts or establishes the direction of growth, movement or opening.

Several levels of expression may be introduced for the axis. A zero axis means that the object has no perceptible privileged direction. A weak axis means that a direction can be inferred but does not organise the entire form. An intermediate axis means that the direction is visible and connected with part of the structure. A strong axis means that the entire form is governed by the axial principle. A leaf with a midrib, for example, possesses a strong morphogenetic axis. A flower may possess weak or multiple axial organisation because radiality predominates. A river system frequently possesses a principal drainage axis with asymmetrical lateral branches. Such coding would make it possible to compare objects of different types.

The third invariant consists of layers. Layering may be visible, hidden, geological, biological, compositional, chromatic, density-based, spatial or temporal. In a flower, layers appear as rows of petals. In a bud, they appear as folded shells. In a stone or geode, they appear as mineral bands and internal zones. In relief, they may appear as terraces, strata or elevation levels. In a nebula,

they appear as shells and zones of brightness. In an artefact, they may appear as concentric bands, ornamental levels or nested figures. The classifier must record the number of layers, their regularity, boundaries, thickness, symmetry and relationship to the centre.

Layering is particularly important to the transition from a simple to a complex form. If an object possesses only an external contour, it may be morphologically interesting, but its internal organisation remains limited. If it possesses several levels, shells or nested contours, it may be assigned to the radial-layered, shell-like or folded-opening type. Real layers must nevertheless be distinguished from visual effects. A cosmic image, for example, may contain colour zones resulting from data processing rather than physical layers in the literal sense. The classifier must therefore record the source of the layering: observed structure, model, image processing or authorial interpretation.

The fourth invariant is radiality. Radiality demonstrates the extent to which a form is organised from the centre towards the periphery. It may be manifested in the petals of a flower, rays of a star, cracks in a crater, rings of a nebula, a mandala, crop circle, shell, protoplanetary disc, geode or ornamental rosette. Radiality does not always entail perfect symmetry. Many natural forms are only approximately radial and contain irregularities, displacements, asymmetries and incomplete sectors. The classifier must therefore be capable of recording both strict and partial radiality.

Parameters of radiality may include the presence of a central point, the number of radial directions, the regularity of angles between elements, recurrence of sectors, degree of correspondence among radial profiles and prominence of an external ring or shell. A lotus, for example, may possess strong radiality while retaining the living asymmetry of its petals. A crater may possess ring-like radiality but have damaged edges. A nebula may display radial expansion accompanied by pronounced filamentary deviations. A crop circle may be geometrically rigorous while possessing a completely different cultural and technological origin. The classifier must preserve these distinctions.

The fifth invariant is the edge. Within the hypothesis of the Matrix, the edge has particular significance because it demonstrates not only the boundary of a form, but also an area of interaction. An edge may be smooth, serrated, undulating, fractal, ruptured, active, growing, erosional, luminous, ornamental, diffuse or sharp. The edge of a leaf may be entire, lobed, serrated or dissected. A coastline may possess a complex and scale-dependent edge. In a chemical system, the edge may constitute a reaction front. In a nebula, it may be the zone of interaction between a gaseous shell and its surroundings. In an artefact, it may be a compositional boundary.

Several characteristics of the edge must be recorded: sharpness, curvature, irregularity, fractal complexity, regularity, the presence of wave-like elements, degree of interaction with the surrounding region and change over time. It is especially important to distinguish between a passive and an active edge. A passive edge merely delimits the form. An active edge participates in growth, opening, destruction, exchange, propagation or visual organisation. The edge of an opening petal, for example, is active during morphogenesis. A coastline is active as a zone of erosion and accumulation. A reaction front is active as the moving boundary of a chemical process. This distinction must be reflected within the classifier.

The sixth invariant is the spiral. Spirality may be strictly geometric, biological, galactic, vortical, decorative, growth-related, filamentary or approximate. In nature, the spiral is frequently associated with growth, rotation, distribution, flow or accumulation. In culture, it may constitute

an ornamental, symbolic or compositional motif. In cosmology, the spiral is particularly important to the analysis of galaxies. In biology, it is significant to phyllotaxis, shells, curls, certain flowers and plant structures. In reaction–diffusion models, it appears in spiral waves.

The classifier must record the presence of a spiral, its type, direction of rotation, number of arms, degree of regularity, relationship to the centre and connection with radiality or layering. It must also recognise that not every curved element is a spiral. The eye sometimes perceives a spiral where only accidental curvature or an asymmetrical shell is present. Rigorous analysis should therefore use geometric criteria: changes in radius relative to the centre, angular direction, recurrence of turns and stability of the form under rescaling.

The seventh invariant is branching. It forms the basis of axial-network structures: trees, roots, leaf venation, mycelia, vascular networks, river systems, cracks, faults, filaments and certain ornaments. Branching may be hierarchical, reticulate, tree-like, radial, chaotic, dichotomous, pinnate, palmate, dendritic, vascular, erosional or artificially compositional. The classifier must record not only the presence of branching, but also its type.

Important branching parameters include the presence of a principal branch or axis, number of branching levels, branching angles, segment lengths, node density, the relationship between principal and lateral branches, the presence of cycles or closed loops, direction of propagation and active growth endpoints. A river network, for example, generally possesses a hierarchical tree-like structure without closed cycles. Mycelium may possess a more reticulate structure. A vascular network may contain complex connections. Leaf venation may be reticulate or parallel. These differences will be fundamental to future graph analysis.

The eighth invariant is fractality. This feature must be used cautiously within the classifier. Not every complex form is fractal in the strict mathematical sense. It is therefore preferable to distinguish among strict fractality, fractal-like organisation and scale-dependent complexity. Strict fractality applies to mathematical objects. Fractal-like organisation may describe natural forms in which self-similarity is observed across a limited range of scales. Scale-dependent complexity may mean that an edge or network becomes more complex as the image is magnified, but without exhibiting strict self-similarity.

For fractality, it is possible to record visual self-similarity, edge complexity, recurrence of motifs at different scales, fractal dimension, box-counting results and the presence of hierarchical structure. This feature is particularly important for coastlines, trees, leaf veins, mycelia, vascular networks, cracks, relief, nebulae, cosmic filaments and certain ornaments. It must not, however, be assigned automatically. A form’s complexity alone does not make it fractal. The classifier must indicate the level of confidence in this assessment.

The ninth invariant is the degree of opening. This feature is directly connected with the A–B–C–D model. It indicates the state of the form: closed, transitional, opened, mature, disintegrating or returning to a new potentiality. In biological objects, the degree of opening is especially apparent: seed, seedling, bud, flower, fruit and new seed. In geological objects, it may manifest itself differently: as a crack, the opening of a fault, the exposure of strata or the erosional revelation of an internal structure. In cultural forms, it may appear as a transition from a central sign to an unfolded composition. In numerical models, it may function as a parametric stage of the process.

The degree of opening may be encoded using a scale. For example: 0 — closed potentiality; 1 — initial disruption of the shell or appearance of an axis; 2 — partial opening or initial branching; 3 — fully manifested structure; 4 — formation of a new centre, fruit, node or secondary potentiality.

This scale should not be applied mechanically to every object. For some forms it will be strongly applicable, for others only conditionally so, and for still others not applicable at all. The classifier must therefore record not only the value of the feature, but also its degree of applicability.

In addition to individual features, the classifier must record their combinations. The hypothesis of the Matrix works not with isolated elements, but with morphological profiles. Centre + layers + radiality + active edge produces the radial-layered type. Axis + branching + nodes + active periphery produces the axial-network type. Edge + high irregularity + scale-dependent complexity produces the fractal-edged type. Shell + closure + internal layers + opening produces the folded-opening type. The classifier must therefore not merely fill individual fields, but also determine the form type from a combination of features.

A graduated scale should be used for each feature rather than only a binary ‘present/absent’ assessment. Centredness, for example, might be absent, weak, moderate or strong. The axis might be absent, hidden, partial or dominant. Layers might be absent, consist of a single level, comprise several irregular levels or demonstrate pronounced multilayering. Radiality might be absent, partial, pronounced or strict. The edge might be simple, complex, active or fractally complex. Branching might be absent, weak, moderate, developed or reticulate. Such a scale would permit more detailed analysis and the construction of numerical profiles.

The confidence of the classification must be recorded simultaneously. A feature cannot always be determined unambiguously. The image may be of insufficient quality; the object may be partially obscured; a cosmic visualisation may depend upon processing; a cultural artefact may be damaged; or a geological map may have inadequate resolution. Every feature should therefore be accompanied by a confidence level: high, medium, low or indeterminate. This is particularly important to scientific honesty. The classifier must acknowledge uncertainty rather than conceal it.

Another element of the classifier should be its connection to the data type. The same feature manifests itself differently in a photograph, satellite image, digital elevation model, telescopic image, archaeological drawing, microscopic image or numerical simulation. A layer within a geological section, for example, has one status; a layer within a colour-processed nebular image another; and a layer within an ornament a third. The classifier must therefore consider the source of the image and the method by which it was obtained. A morphological feature does not exist independently of the data through which it becomes visible.

The classifier of invariants should have two versions: qualitative and quantitative. The qualitative version is required for initial expert annotation. It records features through words and scales. The quantitative version is required for subsequent processing through morphometry, statistics, computer vision and cluster analysis. An expert may identify high radiality, for example, while an algorithm additionally calculates a radial profile. An expert may identify developed branching, while graph analysis calculates the number of nodes, edge lengths and distribution of angles. The two versions should complement one another.

For practical use, the classifier may be represented as a table or digital form. Each row would contain an object, while the columns would contain its features. These might include: object; category; source; centre; type of centre; axis; type of axis; layers; number of layers; radiality; edge; type of edge; spiral; branching; type of branching; fractality; degree of opening; morphological type; confidence level; expert comment; and limitations of interpretation. Such a table would form the basis of a future database. It would make it possible to search, filter and compare objects by their features.

It is especially important that the classifier should be applicable across different levels without being imposed artificially. If a feature is inapplicable, this must be recorded. The degree of opening may be readily applicable to a bud, flower or seed, for example, but less evident in a galaxy. The axis may be important to a leaf or tree, but not to a spherical geode. Radiality may be strong in a mandala but weak in a drainage basin. Fractality may be significant to a coastline but not to a simple circle. Such flexibility would prevent a single scheme from being imposed artificially upon every object.

The classifier must also support negative and control cases. If an object possesses no centre, axis, layers or branching, this is not an error, but important information. Such cases help define the boundaries of the hypothesis. An elliptical galaxy, for example, may possess a centre without spiral arms. Certain stones may be morphologically unexpressive. Certain artefacts may possess a decorative logic unrelated to opening or branching. The classifier should record this neutrally, without attempting to discover the Matrix artificially within every object.

Testing annotation consistency will constitute an important stage. If different experts classify the same object differently, this must be analysed. The feature may have been defined too vaguely. The image may be ambiguous. An expert from one discipline may perceive the form differently from an expert in another. Instructions must therefore be developed for the classifier, and inter-rater agreement must be tested. This would make the system more reliable and reduce subjectivity.

A biologist, for example, may see primarily functional venation within a leaf; a geomorphologist may see a network analogy with a drainage basin; an art historian may see a compositional structure; and a mathematician may see a graph. All these perspectives are useful, but the classifier must provide a common language through which they can be compared. The definitions of features must therefore be sufficiently clear for different specialists to apply them consistently. If every researcher understands the ‘active edge’ differently, it cannot function as a research invariant. If it has explicit criteria, classification becomes reproducible.

The classifier of invariants should be connected with the object’s morphological record. The record describes the object as a whole, while the classifier registers its features according to a standardised scheme. Together, they form the foundation of a future analytical database. A record may contain the cultural context of an artefact, for example, while the classifier records its centredness, layering, radiality and edge. A record of relief may contain geographical data, while the classifier records branching, axis, fractality and active zones. This combination would preserve context while permitting comparison.

At the next stage, the classifier could be used to train computer-vision algorithms. If experts annotate a sufficient number of images, these data could form a training set. An algorithm would learn to recognise centres, contours, branching, layers, spirals and other features. It could then apply the classifier to new images. This is especially important for large corpora in which manual annotation is impossible. Machine classification must nevertheless be reviewed continually by experts to prevent automated errors.

The classifier would also make it possible to construct morphological profiles. Every object would be represented not only by an image, but by a set of feature values. A flower, for example, might have high centredness, high radiality, moderate layering, an active edge, weak branching and a high degree of opening. A river network might have low centredness, an intermediate axis, high branching, moderate fractality, an edge dependent upon the basin, and an inapplicable or conditional degree of opening. A nebula might have moderate centredness, high layering, a

diffusely active edge, partial radiality and high filamentarity. Such profiles could be compared mathematically.

Once morphological profiles have been constructed, cluster analysis will become possible. Objects could be grouped according to structure rather than origin. It could then be determined whether flowers, craters, nebulae and mandalas form a shared radial-layered cluster; whether leaves, river networks, vascular structures and filaments converge according to branching features; whether cultural forms separate from natural ones; and which objects occupy transitional positions. This would provide the hypothesis with a considerably stronger foundation than simple visual comparison.

The classifier of invariants must remain open to modification. At the initial stage, the features may be defined provisionally. As work on the atlas progresses, however, some features may prove redundant, others excessively indeterminate and still others absent. Features of density, textural heterogeneity, gradient, modularity, recurrence, direction of flow, shell-like organisation, nodal structure or degree of asymmetry may need to be added. The classifier should therefore develop as a practical instrument rather than as a closed dogma.

Its core must nevertheless remain stable. If the features change continually, comparison will become impossible. The classifier may therefore be divided into basic and expanded levels. The basic level would contain the principal invariants: centre, axis, layers, radiality, edge, spiral, branching, fractality and degree of opening. The expanded level would contain additional parameters dependent upon the object type: texture, density, gradients, nodes, shells, symmetry, asymmetry, dynamics, material and scale. This approach would preserve a balance between stability and flexibility.

The classifier must also account for the temporal dimension. Certain forms are better analysed not through a single image, but through a sequence of stages. This is especially important for seeds, buds, flowers, chemical reactions, mycelial growth, colony development, erosion, the opening of a crack and numerical models. In such cases, not only the state but also the transition is classified. The degree of opening may change from 0 to 4, for example; the active edge may intensify; branching may increase; and layers may gradually become manifested. The classifier must therefore be capable of working with time series.

Developing a visual key for the classifier will be an important task. Small diagrams may be created for every feature: what counts as a centre, what counts as an axis, how layers are indicated, what an active edge looks like, how a spiral differs from a simple curve, which types of branching exist and how the degree of opening is determined. Such a key would be useful to experts, readers and future participants in the project. It would make the classification transparent and teachable.

The classifier of invariants would also help refine the terminology of the study. If a term cannot be applied to real objects, it must be reconsidered. If it functions effectively and helps distinguish among forms, it receives methodological support. The ‘active edge’, for example, may be tested using biological, geological, chemical and cosmological data. The ‘morphogenetic axis’ may be tested in leaves, trees, artefacts, valleys and folds. The ‘radial-layered structure’ may be tested in flowers, craters, nebulae, mandalas and discs. The classifier would thereby become a test of the language itself.

Within the hypothesis of the Matrix, the classifier performs another important function: it separates strong cases from weak ones. A strong case is an object in which several invariants are clearly and consistently expressed. A moderate case possesses some of the features, but the

structure is incomplete. A weak case contains only one feature or depends upon subjective perception for its similarity. A zero case demonstrates no relevant features. Such gradation would help prevent excessive analogising and make the hypothesis more honest.

In practical terms, the classifier could become the foundation of a future digital instrument. A researcher would upload an image, annotate or automatically extract its contour, centre, axis, layers, branching and other features, after which the system would construct a morphological profile and propose a possible form type. The object could then be compared with others in the atlas. Such a system could become an important instrument of comparative morphology. Even before digital implementation, however, the classifier could exist as a table accompanied by methodological instructions.

Thus, creating a classifier of invariants constitutes the second key step in the scientific programme for further research. For every image in the atlas, it is necessary to record the following features: centre, axis, layers, radiality, edge, spiral, branching, fractality and degree of opening. These features must be defined, graded and connected with the data type, confidence level and morphological profile of the object. The classifier would make it possible to progress from visual analogies to systematic comparison and would establish a foundation for morphometry, statistics, computer vision and expert verification. It should transform the hypothesis of the Matrix from an evocative idea into a practical analytical instrument.

27.3. Creating a Mathematical Model

The third direction of further research should be the creation of a mathematical model of the Matrix. If the atlas of morphogenetic forms collects material and the classifier of invariants translates images into a system of features, the mathematical model must describe the transition of form itself: from a closed state to an opened multilayered structure, from the circle-seed to complex organisation, and from potentiality to manifestation. Without such a model, the hypothesis will remain primarily comparative and descriptive. A mathematical description is required to determine whether the morphogenetic logic of the Matrix can be represented as a formal process.

The point of departure for such a model may be the concept of the circle-seed. In the book, this image has been used to designate closed potentiality: a form that has not yet revealed its internal structure, but already possesses a centre, boundary, compactness and the possibility of further unfolding. In mathematical terms, the circle-seed may be represented as an initial region possessing a particular radius, centre, boundary and set of internal parameters. This region may be homogeneous or contain a hidden heterogeneity that subsequently becomes the source of layers, axes, branching or radial elements.

The first modelling step is to select a minimal set of parameters. For the circle-seed, these might include radius, centre, density, level of internal tension, degree of closure, boundary permeability, symmetry, hidden heterogeneity and the number of potential directions of opening. If the model is to remain more abstract, these parameters may be represented not as physical quantities, but as morphological coordinates. Closure, for example, indicates the extent to which the form is gathered and separated from its environment. Internal tension indicates its readiness for transition. Hidden heterogeneity indicates the presence of a future structure. Edge permeability indicates the possibility of interaction with the external environment.

The second step is to describe the transition from a closed form to initial opening. Within the A–B–C–D model, this corresponds to the transition from stage A to stage B. Mathematically, this transition may be specified through a changing opening parameter. While the opening parameter remains at zero, the form retains the state of a circle-seed. As the parameter begins to increase, disturbances appear at the boundary: a rupture, bend, projection, wave, local expansion, initial axis or first layer. In biology, this may correspond to seed germination or the beginning of a bud's opening. In a geological analogy, it may correspond to the appearance of a crack. In a chemical system, it may be the emergence of a reaction front. In a cultural form, it may be the extension of the composition beyond the central sign.

The third step is to describe multilayering. Following initial opening, the form may begin to generate different levels: shells, rings, petals, folds, recurring contours, density zones or rows of elements. Within a mathematical model, this can be expressed through a radial distribution function. Several zones may be specified from the centre towards the periphery, each possessing its own density, brightness, thickness, curvature or degree of activity. If the layers are concentric, the model will be closer to the radial-layered type. If the layers are disrupted, displaced or asymmetrical, the model must account for deviations from ideal symmetry.

A multilayered structure should not be understood merely as a set of circles. In living and natural forms, layers are frequently deformed, ruptured, partially overlapping, unequal in thickness and characterised by different levels of activity. The model must therefore include a parameter for layer regularity. High regularity is characteristic of geometric diagrams, certain ornaments, mandalas, chemical rings and idealised schemes. Lower regularity is characteristic of flowers, nebulae, geological structures, coastlines and biological tissues. This distinction is important because the model must describe not only ideal forms, but also living variability.

The fourth step is the introduction of radiality. If the circle-seed opens not chaotically, but from the centre towards the periphery, radial organisation emerges. It may be continuous, as in a disc or shell, or discrete, as in a flower with petals, a star, mandala or crop circle. Mathematically, radiality may be described through the angular distribution of elements. The form may be divided into sectors within which length, density, brightness, curvature and the presence of a petal, ray or filament are measured. Radiality then becomes a parameter rather than an impression.

Two directions of change are especially important to a radial-layered model: movement from the centre towards the edge and movement around the circumference. The first demonstrates how the structure becomes more complex along the radius: centre, inner layer, intermediate layer, outer layer and active edge. The second demonstrates the uniformity with which elements are distributed around the circle. An ideal mandala may possess high regularity in both directions. A flower may possess radial recurrence accompanied by biological asymmetry. A nebula may possess a centre and shells while exhibiting considerable angular heterogeneity. Such a model makes it possible to compare different objects without claiming that they are identical.

The fifth step is to describe the active edge. Within the mathematical model, the edge must constitute not merely an external line, but a zone of transition. It may possess parameters of curvature, irregularity, fractal complexity, growth rate, gradient, thickness, permeability, local activity and interaction with the environment. As the form opens, its edge changes. It may become undulating, petaloid, serrated, branching, diffuse or fractal. The edge frequently reveals the degree to which a form is dynamic. The circle-seed model must therefore include the evolution of its boundary.

At an early stage, the edge may be smooth and closed. During opening, it may develop a local rupture or projection. At the stage of manifested structure, it may become many-petalled, filamentary, folded or fractally complex. At stage D, it may generate new centres, seeds, nodes or repeated elements. This dynamic of the edge connects the model with different objects: an opening flower, growing microbial colony, chemical front, coastline, nebular shell or ornamental periphery. Their mechanisms differ, but a common parametric language of the edge may be possible.

The sixth step is the introduction of branching. Not every form emerging from a circle-seed becomes radial-layered. In some cases, development proceeds through an axis and branches. A principal direction then emerges from the initial region, followed by lateral branches, nodes, a network and active growth endpoints. Mathematically, this may be described using graph models, L-systems, recursive rules or probabilistic branching. In this version, the circle-seed does not open like a flower, but unfolds like a tree, root, leaf network, mycelium, river system or filamentary structure.

The parameters important to the branching model include branching probability, branching angle, segment length, branch reduction coefficient, number of levels, node density, growth direction and the presence or absence of cycles. If branches are organised around a central axis, the axial-network type emerges. If branches diverge radially, a dendritic or stellate structure emerges. If branching recurs at different scales, fractal-like organisation appears. The mathematical model must therefore be sufficiently flexible to describe not only the opening of petals, but also the growth of networks.

The seventh step is the inclusion of fractal complexification. Within the Matrix model, fractality may be connected with the repetition of a rule at different scales. The edge of a form may, for example, become more complex through the addition of smaller projections to larger ones. A branch may generate smaller branches. A layer may contain nested layers. A spiral may unfold while changing scale. Mathematically, this may be described through iterations, recursive rules, scaling coefficients, random perturbations and environmental constraints. Such a model would help connect the Matrix with fractal and fractal-like structures.

The fractal component must not, however, be introduced automatically. Not every form of the Matrix is fractal. A radial mandala may be layered without being fractal. A smooth seed may constitute closed potentiality without possessing scale-dependent complexity. Certain flowers possess regular symmetry without having a fractal edge. Fractality should therefore constitute one possible regime of the model rather than a compulsory property of every form. This is important to maintaining precision.

The eighth step is the description of the spiral regime. A circle-seed may develop not only into a radial or branching structure, but also into a spiral one. A spiral may be represented as the growth or distribution of elements in which the radius changes together with the angle. In biology, this may be connected with phyllotaxis, curls, shells or certain floral structures. In cosmology, it may be connected with galactic arms. In chemical models, it may appear in spiral waves. In culture, it may be present in ornaments and sacred geometry. Mathematically, the spiral regime may be specified through an equation expressing radius as a function of angle, together with a growth or density parameter.

The spiral regime is particularly important because it connects centre, movement and opening. Unlike a simple circle, a spiral already possesses direction. It not only surrounds the centre, but moves away from or towards it. Within the Matrix model, the spiral may therefore describe a

transitional form between closed centredness and an expanding structure. It remains important to distinguish among a geometric spiral, physical vortex structure, biological growth curl and cultural ornament. Their mathematical forms may be similar, but their mechanisms differ.

The ninth step is the parameterisation of the A–B–C–D model. In the most general form, stage A may be described by high closure, a low degree of opening, few layers, little branching and a simple edge. Stage B may be described by reduced closure and the appearance of an axis, rupture, first layer or initial front. Stage C may be described by a developed structure: layers, branches, radiality, an active edge, fractal complexity or spirality. Stage D may be described by the emergence of a new centre, seed, node, daughter structure, fragmentation or transition to a new cycle. Such parameterisation would make it possible to compare different processes as trajectories within morphological space.

The A–B–C–D stages must not be rigid or identical for every object. They constitute an abstract framework rather than a mechanical scheme. In a seed, the stages may be biologically evident. In a flower, they may be associated with opening and fruiting. In a geode, they may be associated with a closed shell and the exposure of the interior through cutting or destruction. In a fault, they may be associated with the accumulation of tension and the opening of cracks. In a chemical reaction, they may involve the emergence of a front and pattern. In a cultural artefact, they may involve a composition extending from the centre towards the periphery. The model must therefore allow different trajectories within a shared logic.

The tenth step is the creation of a morphological space. Every object or stage may be represented as a point within a parameter space consisting of closure, centredness, axiality, layering, radiality, branching, edge activity, fractality, spirality and degree of opening. The development of a form would then appear as a trajectory within this space. The circle-seed occupies a region of high closure and low differentiation. An opened multilayered structure moves towards a region of high layering, radiality and edge activity. A branching structure moves towards the region of axiality and network complexity. This approach would make it possible to formalise different types of the Matrix.

Morphological space is especially valuable because it does not reduce every form to a single image. Different objects may occupy different regions while remaining connected through trajectories or parametric proximity. A flower and mandala, for example, may be close in centredness, radiality and layering while differing in biological dynamics and cultural status. A leaf and river network may be close in axis and branching while differing in material and function. A nebula and chemical ring may be close in shell-like organisation and active edges while differing in scale and mechanism. The model permits similarities and differences to be perceived simultaneously.

The eleventh step is the development of generative rules. If the model is intended not only to describe but also to produce forms, rules governing parameter changes must be specified. For example: if internal tension exceeds a threshold, the edge becomes unstable; if opening increases, layers emerge; if the axis becomes dominant, branching begins; if the radial gradient remains stable, a ring structure forms; if local perturbations intensify, the edge becomes fractally complex; and if a rotational component emerges, a spiral appears. Such rules may remain simple at the initial stage and become more complex as the model develops.

Different types of mathematical description are possible. A geometric model may work with contours, radii, angles, layers and curvature. A dynamic model may describe the change of parameters over time. A graph model may describe branching and networks. A reaction–diffusion

model may describe patterns within a medium. An L-system may describe growth algorithms. A fractal model may describe self-similar complexification. An agent-based model may describe interactions among local elements. A probabilistic model may describe variability and noise. It is unnecessary to search immediately for one universal formula. It is more realistic to construct a family of models linked by shared parameters of the Matrix.

A simple basic model could be developed first. It could be two-dimensional and describe the transition from a circle to a multilayered radial form. It would contain a centre, radius, number of layers, degree of opening, edge irregularity, symmetry and random perturbations. Such a model could generate different variants: a smooth circle, ring structure, rosette, many-petalled form, asymmetrical shell or fractally complex edge. Even this simple model would make it possible to test which parameters are responsible for visually significant differences.

An axial and branching regime could then be added. In this version, a principal direction would emerge from the centre or initial region, followed by lateral branches. The branching parameters would determine whether the form resembled a leaf, tree, root, river network, crack or filament. L-systems, graph rules or probabilistic propagation across a field could be used. Such a model would make it possible to examine the transition from the circle-seed to an axial-network structure—that is, another branch of the morphogenetic logic.

The third level of the model could incorporate interaction with the external environment. In real systems, form does not develop in a vacuum. A seed interacts with moisture, temperature and soil. A plant interacts with light and gravity. A river interacts with relief and rocks. A crack interacts with stresses within the material. A nebula interacts with radiation and the gaseous medium. An artefact is shaped by material, technique and cultural canon. The mathematical model of the Matrix should therefore not be purely internal. It should contain environmental parameters: resistance, gradient, noise, flow direction, spatial constraint and field heterogeneity.

Incorporating the environment is especially important to understanding the active edge. The edge is active precisely because it interacts with what lies outside it. The model may specify an environmental gradient that influences growth, opening, branching or deformation of the edge. The form would then not merely unfold from within, but also respond to external conditions. This would bring the model closer to real processes of self-organisation and prevent its geometry from becoming excessively idealised.

The fourth level of the model should account for randomness. No natural form is absolutely ideal. Even a symmetrical flower contains variations. A river network depends upon random irregularities in relief. Cracks propagate through heterogeneous material. Nebulae possess turbulent structures. A cultural ornament depends upon the craftsperson’s hand, material and tradition. The Matrix model must therefore include controlled noise. Randomness does not destroy order here, but makes it living and variable. It is important to investigate which invariants persist under noise and which disappear.

The fifth level is the comparison of the model with real objects in the atlas. The mathematical model will be meaningful only if its results can be compared with images. A model may, for example, generate a radial-layered form. Its morphological profile would then be compared with that of a flower, crater, mandala or nebula. If the parameters are close, the model may be considered useful for describing the relevant type. If they are not, it must be adjusted. The model should therefore be connected with the atlas and the classifier of invariants.

It is especially important not to transform the mathematical model into a new evidential exaggeration. If the model produces a form resembling both a flower and a nebula, this does not mean that the flower and nebula possess the same mechanism. It means only that a formal procedure exists that can generate a similar morphological profile. The model demonstrates possibility, but does not establish causality. It should therefore be used as an instrument of analysis and comparison rather than as a universal explanation for the origin of all forms.

The mathematical model may be constructed in several versions. The first version would be descriptive: it would simply translate a form into parameters. The second would be dynamic: it would describe changes in parameters over time. The third would be generative: it would produce forms according to rules. The fourth would be comparative: it would calculate the distance between real and modelled objects. The fifth would be predictive: it would propose which intermediate forms should arise under particular parameters. Each version possesses its own level of complexity and evidential strength. Work should begin with the first two before progressing gradually towards the more complex versions.

A simple set of basic parameters may be proposed for the model describing the transition from a circle-seed to a multilayered structure: C — centredness; O — axiality; L — number of layers; R — radiality; E — edge activity; B — degree of branching; F — fractal complexity; S — spirality; U — degree of opening; and P — probability of the emergence of a new centre. These parameters may vary from 0 to 1 or according to another scale. The initial state possesses high closure and low values of U, L, B and F. As development proceeds, U increases, L, R, E, B or S emerge, and P may increase at the final stage, indicating the formation of a new potentiality.

Such a parametric language would make it possible to describe different trajectories. A floral trajectory would demonstrate high centredness, increasing opening, and growth in layering, radiality and edge activity. A leaf trajectory would involve the appearance of an axis, increased branching and the formation of an edge and surface. A mycelial trajectory would involve increasing branching, edge activity and fractal complexity. A crater trajectory would include a centre, ring-like shell, radial disturbances and an active edge of destruction. A mandala trajectory would include a centre, layers, radiality, high regularity and low noise. This approach makes it possible to discuss not one Matrix as an image, but different regimes of a shared structural logic.

A software simulation could subsequently be developed. The user or researcher would specify the initial parameters of the circle-seed, degree of internal tension, type of symmetry, level of noise, edge parameters, branching probability, number of layers and spiral component. The program would generate a form and display its morphological profile. This profile could then be compared with objects in the atlas. Such a simulation could become both a research and educational instrument. It would demonstrate how changing parameters produces different types of form.

The connection between the mathematical model and machine learning is especially promising. If the atlas becomes sufficiently large, an algorithm could be trained not only to recognise features, but also to identify the parameters that most effectively generate a similar form. A model might compare a real flower with generative forms and select the parameters producing the closest result. The same parameters or a similar trajectory could then be tested against other objects. Such an approach may help identify hidden families of forms and refine the morphological space of the Matrix.

The mathematical model must nevertheless remain interpretable. An excessively complex neural-network system may generate beautiful forms without explaining which parameters are

responsible for them. For the scientific programme, it is more important not merely to obtain an image resembling a flower, nebula or ornament, but to understand which changes in the centre, edge, layers, branching and opening produced that form. Models whose parameters possess morphological meaning are therefore preferable within the present hypothesis. Interpretability is more important than visual effect.

Creating a mathematical model would also help define the limits of the hypothesis more clearly. If certain forms cannot be reproduced even approximately using the selected parameters, this would demonstrate that the model is incomplete or inapplicable to those objects. If reproducing an object requires an excessive number of arbitrary adjustments, the analogy may be weak. If, by contrast, a simple model with few parameters regularly generates forms close to objects in the atlas, this would strengthen the hypothesis. Modelling would therefore become an instrument not only of confirmation, but also of criticism.

Connecting the model with experiments will be an important task. Reaction–diffusion systems may be used to test the emergence of spots, stripes, rings and spirals. Biological observations may test the stages of bud opening and leaf growth. Geological data may test models of faults, folds and drainage networks. Cosmological data may test the morphological parameters of shells and spirals. Cultural forms may be used only as comparative material rather than as physical experiments. This connection would prevent the model from remaining a pure abstraction.

It should also be recognised that no single model will be able to describe everything. The hypothesis of the Matrix requires not one formula, but a family of related models. One model may describe radial-layered opening. Another may describe axial-network branching. A third may describe the active edge. A fourth may describe fractal complexification. A fifth may describe the spiral regime. A sixth may represent A–B–C–D as a general dynamic of transitions. All may be connected through a common parametric language. This is a more realistic and scientifically robust approach than searching for a single universal mathematical scheme.

In philosophical terms, creating a mathematical model is highly significant. It demonstrates that the Matrix is understood not as an undefined force, but as a formalisable structural logic. The model does not prove the metaphysical meaning of the Matrix, but demonstrates that some of its elements can be translated into operational parameters. This makes the hypothesis more open to criticism, testing and development. Where a model exists, it is possible to debate parameters, conditions, results and applicability. This is preferable to debating an indeterminate image.

Thus, creating a mathematical model constitutes the third key direction of the scientific programme for further research. Such a model should formally describe the transition from the circle-seed to a multilayered structure, from closed potentiality to an opened form, and from the centre to layers, an axis, branching, an active edge, a spiral and a new potentiality. It should include parameters of centredness, axiality, layering, radiality, edge activity, branching, fractal complexity, spirality and degree of opening. The model must not, however, claim to explain every form in the world through a single mechanism. Its purpose is to create a formal language of morphogenesis that can be compared with the atlas, classifier, numerical simulations, experimental data and independent verification.

27.4. Testing on Independent Samples

The fourth direction for further research should be the testing of the hypothesis on independent samples. This is one of the most important stages of the entire scientific programme, because it is precisely this stage that makes it possible to reduce the risk of subjective selection. As long as the researcher personally selects images for comparison, there is always a danger that the corpus will include only the most expressive, attractive and convenient examples. In that case, the hypothesis will appear convincing, but its evidential force will remain limited. To move to a more rigorous level, it is necessary to use images that the author has not manually selected in advance to fit the presumed scheme of the Matrix.

The problem of subjective selection is especially significant for visual hypotheses. The human eye easily notices similarity where it is expressive, and just as easily overlooks cases in which similarity is absent. If one selects a nebula resembling a flower, one relief form reminiscent of a leaf, one artefact with a radial composition and one river network with ideal branching, it is possible to create an impressive visual argument. Such a selection, however, does not yet show how frequently and consistently the corresponding features occur in real datasets. It only shows that suitable examples exist. For scientific testing, this is not enough.

An independent sample means that images are selected not according to their previously noticed similarity to the Matrix, but according to an external rule. For example, one may take a random set of satellite images of one region, a random set of leaf images from a botanical database, a set of nebulae from an astronomical catalogue, a series of galaxies of a particular type, or a collection of artefacts from a specific museum or archaeological period. The main condition is that the selection criterion must be defined before the morphological features are analysed. In that case, the researcher will not be able to select only confirming cases unnoticed.

Several types of independent samples may be used to test the hypothesis:

- the first type is a random sample. From a large image database, a specified number of objects is selected at random, after which they are analysed according to the classifier of invariants;
- the second type is a stratified sample. Objects are selected by category: for example, an equal number of seeds, leaves, relief forms, nebulae, galaxies and artefacts;
- the third type is a control sample. It includes objects that should not demonstrate strong correspondence with the hypothesis;
- the fourth type is a blind sample, in which the expert or algorithm does not know to which authorial triad or idea the image relates.

A random sample is important for testing the frequency of features. If centre, axis, branching, layers, active edge or fractal complexity are consistently found in randomly selected images from different levels, this will be a far more serious result than the demonstration of isolated examples. If, however, these features are rare or do not form stable combinations, the hypothesis will have to be limited. It may remain interesting for particular classes of forms, but not claim broad interlevel regularity.

A stratified sample makes it possible to compare categories with one another. For example, one may take one hundred images each of leaves, flowers, river networks, craters, nebulae, galaxies and artefacts. Then, for each object, the features are recorded: centre, axis, layers, radiality, edge, spiral, branching, fractality and degree of disclosure. After that, it becomes possible to see which features are characteristic of each group, which overlap between groups, and which

remain specific. Such an approach will make it possible to test whether common morphological invariants really exist or whether the similarity is limited to individual pairs of objects.

Control samples are necessary to protect against false coincidences. For example, if the hypothesis claims that the authorial BIO–GEO–COS triads have pronounced morphological proximity, they must be compared with random triads. If the objects selected by the author turn out to be significantly closer to one another in their morphological profile than random combinations, this strengthens the hypothesis. If, however, random triads produce the same level of proximity, the authorial selection loses evidential force. A control sample makes it possible to test whether visual persuasiveness is not simply the result of the ordinary human ability to find similarities.

Blind testing is especially important for expert annotation. Experts can be given images without names, categories or authorial comments. They must classify the features of form: whether there is a centre, an axis, layers, branching, an active edge, radiality, fractality, spiralness and degree of disclosure. The results are then compared with the author's interpretation and with one another. If independent experts see the same features, this strengthens the reliability of the classification. If the assessments diverge strongly, this means that the features are defined insufficiently clearly or that the object is too ambiguous.

Independent samples must be connected with the atlas of morphogenetic forms, but they must not coincide with its initial authorial part. A pilot atlas may include strong and demonstrative examples needed for developing the language and classifier. The testing part of the atlas, however, must be formed separately. In it, images must enter the database according to pre-defined rules: random selection, catalogue, region, time period, object type or data source. This separation will make it possible to distinguish honestly between an illustrative corpus and a testing corpus.

It is especially important to conduct independent testing for the most striking comparisons. For example, the triad "flower — relief — nebula" is visually persuasive, but it must be tested on a large number of flowers, relief forms and nebulae. It is necessary to determine how frequently the combination of centre, layers, radiality and active edge occurs in these three groups. If such a combination is found only in specially selected objects, the triad remains a beautiful illustration. If it appears in a significant part of the independent sample, the triad receives a more serious basis.

The same applies to the triad "leaf — valley — cosmic shell". Here, it is necessary to test not the general impression, but the parameters: axis, branching, distribution of lines, edge, internal network, relation between the main line and lateral branches, and fractal complexity. Random leaves, random valleys and random cosmic structures may turn out to be much less similar than specially selected examples. This will not destroy the hypothesis, but it will help to clarify exactly which subtypes of forms are genuinely comparable.

For geological data, an independent sample may be constructed on the basis of cartographic and remote-sensing sources. For example, several regions may be selected according to a coordinate grid without knowing in advance how expressive the relief will be. River networks, coastlines, faults, craters, folds and other forms can then be identified automatically or manually. This will make it possible to test which morphological features genuinely occur on the Earth's surface and which are the result of selecting the most attractive satellite images. Such an approach is especially important for testing axial-network and fractal-edge types.

For biological data, botanical databases, herbarium images, microscopic archives, photographs of plant developmental stages, and image databases of mycelia, corals, tissues and vascular structures may be used. It is important to select objects not only according to their correspondence with the Matrix, but also according to taxonomic, morphological or experimental criteria. For example, one may take leaves from different plant families, flowers with different types of symmetry, seeds of different forms, and fungal colonies of different species. This will make clear which features are connected with general morphology and which depend on a particular group of organisms.

For cosmological data, independence is especially important because of the strong visual processing of images. Catalogues with a clear provenance of objects should be used: type of nebula, telescope, observational range, processing method and scale. It is desirable to analyse not only popular colour images, but also scientific intensity maps, contours, radial profiles and data in different spectral ranges. If only striking images are analysed, the risk of visual illusion will be too high. An independent sample must also include less expressive, less symmetrical and more chaotic objects.

For cultural objects, an independent sample must be formed with regard to archaeological and historical context. For example, one may take all available images of vessels or seals from a particular culture, not only those in which there is a circle, tree, spiral or lotus. Or one may select objects from one museum catalogue without knowing in advance how far they correspond to the hypothesis. Such an approach will make it possible to test whether the morphology of the Matrix is genuinely noticeable in the cultural system or whether it appears only when individual artefacts are selectively chosen.

Independent testing must also include negative expectations. For example, if the hypothesis assumes that radial-layered features should occur more frequently in flowers, mandalas, craters and some nebulae, but not necessarily in river networks or leaves, this can be tested. If axial-network features should occur more frequently in leaves, rivers, vessels and mycelia, but more weakly in geodes or elliptical galaxies, this is also testable. Such expectations make the hypothesis more precise. It does not say that all features must be everywhere, but assumes a distribution of features by types of forms.

The comparison of strong authorial examples with independent samples will be especially important. Authorial examples are necessary for formulating the idea, but they must not be the only basis. The following procedure can be carried out: first, authorial triads and their morphological profiles are identified. Then hundreds or thousands of triads of the same type are randomly formed from an independent database. After that, the distances between objects within the authorial and random triads are compared. If the authorial triads have a statistically smaller distance, this means that they genuinely represent special morphological combinations. If not, their status must be reconsidered.

For such testing, it is necessary to define distance metrics. Each object has a morphological vector: centricity, axiality, layering, radiality, edge, spiralness, branching, fractality, degree of disclosure and other parameters. The distance between objects can be calculated according to these features. The closer the vectors are, the higher the morphological proximity. Such an approach will make it possible to replace the subjective statement “the objects are similar” with a more testable one: “the objects have a small distance in feature space”. This will be an important step towards the formalisation of the hypothesis.

Independent samples will also help to identify overfitting of the hypothesis to the authorial material. In machine learning, overfitting occurs when a model works well on the data on which it was built, but poorly on new data. An analogous danger also exists in theoretical work. If the hypothesis explains only the images selected by the author well, but works poorly on new samples, this means that it is too closely adapted to its initial examples. Testing on independent data shows how far the hypothesis generalises.

An important element should be the pre-registration of analysis criteria. Before viewing the independent sample, it is necessary to specify in advance which features will be tested, which metrics will be used, which results will be considered to support the hypothesis, and which will weaken it. This will reduce the risk that, after obtaining the data, the researcher will begin to adjust the criteria to fit the result. Such a practice is especially important for a hypothesis in which visual interpretations may be flexible. The clearer the rules are in advance, the greater the confidence in the conclusions.

Sample size must also be taken into account. A sample that is too small will not allow robust conclusions to be drawn. For example, five nebulae, ten leaves and three artefacts cannot confirm a broad hypothesis. At the pilot stage, such volumes are acceptable for tuning the method. At the testing stage, however, dozens, hundreds and, in some cases, thousands of objects are needed. This is especially true of images available in large databases: satellite images, biological photographs, astronomical catalogues and museum collections. A large sample reduces the role of chance and subjective selection.

Sample size, however, must not replace data quality. If images have different scales, strong processing, unclear provenance, low resolution or ambiguous context, the analysis may be weak even with a large quantity. Therefore, for independent testing, volume and quality must be combined. It is better to have a smaller but well-documented sample than a huge set of images without sources and metadata. This is especially important for cultural and cosmological materials.

For independent samples, the original images and processed versions must be stored separately. The original image shows the primary material. The processed version may include a contour, segmentation, network skeleton, identified centre, radial profiles, layers, graph model or edge map. If the analysis is carried out on the processed version, the algorithm and processing parameters must be specified. This will allow other researchers to repeat the test. Without such transparency, the results will be difficult to reproduce.

Independent testing must include inter-expert assessment. Different specialists may see features of form differently. A biologist, geologist, astronomer, art historian, mathematician and computer-vision specialist have different skills in perceiving images. It is therefore useful to give the same sample to several experts. If the classification of features coincides, this indicates reliability. If it diverges strongly, the definitions must be refined or ambiguity acknowledged. Inter-expert agreement is an important criterion of classifier quality.

Expert and algorithmic annotation must also be compared. Computer vision can identify contours, branching, centres, layers and fractal parameters more consistently than a human being, but it may make mistakes in semantic interpretation. An expert may understand the object better, but be subject to visual expectations. If expert and machine annotation converge, this strengthens the result. If they diverge, the reason must be analysed: an algorithmic error, ambiguity of the image, weakness of the feature definition or subjectivity of the expert.

Independent samples will help to refine not only the hypothesis as a whole, but also individual terms. For example, the concept of an active edge can be tested on biological, geological, chemical and cosmological images. If different experts and algorithms consistently identify active edges in different types of data, the term receives support. If not, it must be refined. The same applies to the morphogenetic axis, radial-layered structure, axial-network type, fractal-edge form and degree of disclosure. Thus, sample testing becomes a test of the terminological apparatus.

It is important that independent testing may produce different results, and all of them will be useful. If the hypothesis is confirmed on many samples, its status is strengthened. If it is confirmed only in particular classes of objects, it becomes narrower but more precise. If it is not confirmed statistically but remains productive as a philosophical and visual-analytical language, its status must be changed. If some terms do not work, they must be revised. The scientific programme must be ready for such development. Testing is needed not to defend the idea at any cost, but to refine it.

It is especially important to accept in advance the possibility of a partially negative result. For example, it may turn out that flowers and mandalas really do have similar radial-layered profiles, but that nebulae are too diverse for stable comparison. Or that leaf veins and river networks have graph-based similarity, but cosmic filaments form a different type of network. Or that cultural artefacts depend too strongly on local context to be directly included in a general morphological classification. Such conclusions would not be a failure, but a normal result of testing.

Testing on independent samples will also help to separate universal invariants from particular motifs. Some features may prove to be genuinely widespread: centre–periphery, branching, layering and active edge. Others may be more limited: spiralness, strict radiality, the A–B–C–D model, and fractality in the strict sense. Such differentiation will make the hypothesis more complex and mature. It will cease to be a claim about the complete unity of all forms and will become a map of the distribution of different invariants across different classes of objects.

An important result of independent testing may be a scale of reliability for morphological analogies. A strong analogy is confirmed visually, morphologically, parametrically and statistically on independent samples. A medium analogy is confirmed visually and morphologically, but requires further data. A weak analogy is based mainly on visual impression. An unconfirmed analogy does not pass sample testing. Such a scale will make it possible to rank the research material honestly and not use all examples with the same force.

It is also possible to construct a map of the hypothesis's robustness. On one axis there would be types of objects: biological, geological, oceanic, cosmological, cultural and experimental. On the other, the invariants: centre, axis, layers, radiality, edge, spiral, branching, fractality and disclosure. In the cells, one can indicate the degree of confirmation on independent samples. Such a map will show where the hypothesis is strong, where it requires refinement and where it is weak. This will be far more honest and useful than a general assertion of an all-embracing Matrix.

For practical implementation, one may begin with a pilot independent test. For example, 50 images can be taken in each of five categories: leaves, river networks, nebulae, craters and artefacts. For each image, the features are annotated according to the classifier. The distribution of features is then compared and it is tested whether the expected morphological groups are formed. Such a pilot will not provide a final answer, but it will show how well the method works. After that, the sample can be expanded and the features refined.

The next stage may be expanded testing on open databases. Biological images can be taken from botanical and microscopic collections. Geological images can be taken from open satellite and topographic data. The ocean floor can be taken from bathymetric models. Cosmological objects can be taken from astronomical catalogues and archives. Cultural artefacts can be taken from museum databases and archaeological publications. At the same time, each source must be documented. Openness of data will allow other researchers to repeat the analysis.

Independent testing must be not a one-off procedure, but a permanent principle. Every new strong analogy found by the author must then be tested on broader material. If a new triad appears, it must be compared with random triads. If a new term is introduced, its applicability must be tested on independent objects. If a model creates a new form, it must be compared with real data. In this way, the independence of samples will become a permanent mechanism of self-criticism for the hypothesis.

Such an approach is especially important for protecting the hypothesis against accusations of arbitrariness. A critic may say that the author has simply selected beautiful pictures. The response must be a structure of testing: the samples were formed in advance, the features were defined in advance, control groups were used, the results were statistically assessed and negative cases were taken into account. Then the discussion will move from the level of taste and impression to the level of methodology. This is the necessary transition from a visual concept to a scientific programme.

At the same time, independent testing must not destroy the creative core of the hypothesis. The author's view is important at the search stage. Many scientific ideas begin with an intuitive observation, an unexpected analogy, a visual similarity or an imaginative connection. But this intuition must then be tested. In this sense, an independent sample is not opposed to creativity, but is its continuation. It helps to understand where intuition was accurate and where it was too bold.

Thus, testing on independent samples is the fourth key direction of the scientific programme for further research. It is necessary in order to avoid the subjective selection of images and to test whether the presumed morphological invariants persist beyond the authorial examples. To do this, random, stratified, control and blind samples must be used; analysis criteria must be defined in advance; authorial triads must be compared with random ones; and morphological vectors, statistics, expert and algorithmic annotation must be applied. Such testing may confirm, limit or refine the hypothesis, but in any case it will make it more scientifically stable and open to criticism.

27.5. Interdisciplinary Expert Review

The fifth direction for further research should be an interdisciplinary expert review of the hypothesis. If the atlas creates a corpus of images, the classifier records invariants, the mathematical model describes transitions of form, and independent samples protect the research from subjective selection, then expert review should ensure the scientific correctness of the interpretations. The Hypothesis of the Unified Matrix of the Universe is too broad to be developed through the efforts of one author or one discipline alone. It concerns biology, geology, cosmology, mathematical modelling, philosophy, cultural studies, archaeology, art history and the theory of complex systems. Its further testing must therefore be collective.

Interdisciplinary expert review is necessary above all because each field of knowledge has its own standards of explanation. A biologist looks at the form of a leaf differently from a mathematician. A geologist understands a river network or a fault differently from a philosopher of form. An astronomer assesses a nebula or galaxy differently from an artist or cultural studies scholar. An archaeologist interprets an artefact differently from a specialist in morphometrics. If the hypothesis seeks to connect these levels, it must take into account the professional boundaries of each of them. Otherwise, there is a risk that the general morphological scheme will begin to replace specific disciplinary explanations.

The first group of experts should consist of specialists in biology and morphogenesis. Their task is to check how correctly the hypothesis describes seeds, buds, flowers, leaves, tissues, mycelia, corals, vascular networks and other living forms. Biologists can clarify which features are genuinely connected with growth and development, which are external morphological effects, and which depend on species, environment, developmental stage or function. It is especially important that the biological part should not reduce living forms to geometric schemes. A living organism has its own dynamics, genetic regulation, tissue organisation and ecological embeddedness.

Biological expertise can show where the hypothesis is strong and where it needs clarification. For example, the idea of disclosure is well applicable to a bud and a flower, but not every biological process is conveniently described through the A–B–C–D model. A leaf does indeed have an axis, branching and an edge, but types of venation differ so substantially that a more refined classification is needed. A mycelium demonstrates networked expansion and an active edge, but its growth is connected with the colonisation of a substrate, nutrition and environmental conditions. Vascular networks can be analysed graph-theoretically, but their function does not coincide with the function of river networks. Precisely such clarifications will make the hypothesis scientifically stronger.

The second group should consist of geologists, geomorphologists and geophysicists. Their task is to check the terrestrial block of the hypothesis: relief, faults, folds, river networks, coastlines, craters, volcanic forms, the ocean floor, bathymetric maps and geophysical fields. Specialists in this field will be able to indicate which forms are genuinely the result of processes of branching, erosion, tectonics, sedimentation, gravity, volcanism, glacial dynamics or marine geomorphology. They will also be able to separate forms that are visually similar but genetically different.

Geological expertise is especially important for preventing excessive analogisation. A river network may resemble the venation of a leaf, but a geomorphologist must specify catchment parameters, slope, lithology, stream order, drainage density and the history of formation. A crater may resemble a flower or mandala, but it must be analysed as an impact, volcanic or other type of ring structure. A coastline may be an example of an active edge, but its form depends on waves, currents, rocks, sea level and time. If these processes are not taken into account, morphological comparison becomes too superficial.

The third group should consist of specialists in cosmology, astronomy and astrophysics. Cosmic material is especially visually impressive, but precisely for this reason it requires rigorous expertise. Astronomers must check how correctly images of nebulae, galaxies, gas-and-dust clouds, supernova shells, protoplanetary discs and filamentary structures are used. They must assess which features are real physical structures and which depend on the observational range, data processing, colour visualisation, projection or scale.

Astrophysical expertise will help to avoid turning cosmic images into aesthetic evidence. For example, a nebula may look like a flower because of colour processing and the choice of observational range. A galactic spiral may be morphologically interesting, but its explanation is connected with gravitational dynamics, rotation, density waves, interactions and the history of the galaxy. A cosmic filamentary network may resemble a mycelium or neural structure, but it forms in an entirely different physical environment. The expert must show which comparisons are admissible at the level of form and which cross the boundary of scientific caution.

The fourth group should consist of mathematicians, specialists in the theory of complex systems, computational modelling and statistics. Their task is to check the formal side of the hypothesis: morphometrics, fractal analysis, graph analysis, the A–B–C–D model, the parametric space of form, reaction–diffusion models, L-systems, fractal iterations, and models of folding and disclosure. It is precisely this group that should help translate the hypothesis from the language of images into the language of rigorous procedures.

Mathematical expertise is especially important for determining which features can be measured reliably. For example, the fractal dimension of an edge must be calculated using a correct methodology and within a meaningful range of scales. Graph analysis of branching must take into account the type of network, nodes, edges, direction and hierarchy. The A–B–C–D model must be presented not only as a scheme, but also as a system of parameters. Statisticians must check which samples are sufficient, which control groups are needed, which metrics of distance between morphological profiles are admissible, how to assess the significance of results and how to avoid false correlations.

The fifth group should consist of specialists in computer vision, artificial intelligence and image analysis. Their task is to develop tools for the automatic segmentation and identification of contours, centres, axes, layers, branches, active edges, spirals and fractal parameters. They can help create the digital infrastructure of the atlas, train classification models, construct morphological vectors, conduct cluster analysis and compare authorial triads with random ones. Without such a technological block, the hypothesis will remain limited to manual analysis.

AI experts must also indicate the risks of algorithmic error. Computer vision may recognise not the structure of form, but features of the image: colour, contrast, processing style, resolution, background, noise or data source. A neural network may find correlations that have no morphological meaning. Algorithms must therefore be interpretable, testable and connected with intelligible features. For the Matrix hypothesis, it is important not merely to obtain an attractive automatic classification, but to understand which features formed the basis of that classification.

The sixth group should consist of philosophers of science, philosophers of form, methodologists and specialists in epistemology. Their task is to assess the logical structure of the hypothesis: what in it is an empirical claim, what is a model, what is a metaphor and what is a philosophical generalisation. They should help separate testable propositions from interpretative ones, clarify the status of the concept of the Matrix, define the limits of analogy, and point out possible circular reasoning and excessive generalisations. Philosophical expertise is needed not to adorn the text, but to control its conceptual rigour.

It is precisely philosophers and methodologists who can help formulate correctly the central status of the hypothesis. It should not be presented as a definitively proven law of the universe. It is more correct to regard it as an interdisciplinary research programme studying the recurrence of morphological invariants in different systems. This formulation makes the hypothesis stronger,

because it recognises the limits of provability and opens the way to testing. Philosophical expertise will help preserve the scale of the idea while preventing it from dissolving into indeterminate metaphysics.

The seventh group should consist of cultural studies scholars, archaeologists, art historians, scholars of religion and historians of culture. Their participation is especially important for the analysis of artefacts, reliefs, ornaments, sacred geometry, the World Tree, lotus, mandalas, Sri Yantra and other cultural forms. These specialists must check whether the morphological interpretation violates the historical context. They can indicate which meanings have already been established, which are disputed, which are connected with a specific tradition and which are modern projections.

Cultural and archaeological expertise should protect the hypothesis from hyperinterpretation. If there is a circle, crescent and star on a relief, this does not automatically mean that we are dealing with an ancient A–B–C–D scheme. If there is a tree in an ornament, this does not mean that the culture consciously recorded a universal morphogenetic model. If there is a centre and layers in a sacred diagram, this does not cancel its religious meaning. Experts should help formulate morphological reading as an additional layer, not as a replacement for historical meaning.

Interdisciplinary review should be organised in stages. At the first stage, specialists may assess the existing text and identify contentious points. At the second, they may check the terminology: active edge, morphogenetic axis, circle-seed, structural invariant, radial-layered structure, axial-network type, degree of disclosure. At the third, they may evaluate the atlas of images and the classifier of features. At the fourth, they may participate in the annotation of independent samples. At the fifth, they may discuss the results of morphometrics, statistics and modelling. At the sixth, they may prepare joint recommendations for refining the hypothesis.

It is very important that expert review should not be formal. It is not enough simply to collect positive reviews. Genuine expertise must be critical. Experts must have the right to disagree, point out errors, propose limitations, exclude weak analogies, refine terms and demand additional data. If expert review turns only into confirmation of the author’s idea, it loses its meaning. Its value lies precisely in its ability to identify weak points before they become the subject of external criticism.

Several forms of expert work can be proposed. The first is individual reviews by specialists of particular sections. A biologist reviews the biological chapters, a geologist the geological chapters, an astronomer the cosmological chapters, and a cultural studies scholar the cultural chapters. The second is interdisciplinary seminars in which one and the same object is discussed by specialists of different profiles. The third is expert annotation of images according to the classifier of invariants. The fourth is collective discussion of the mathematical model. The fifth is the publication of individual results in specialised journals or collections in order to obtain external scientific criticism.

The format of an expert panel may be especially useful. For example, one morphogenetic triad is taken: leaf — valley — cosmic filamentary structure. A biologist describes the leaf, a geomorphologist the valley, an astrophysicist the cosmic structure, a mathematician the branching parameters, and a philosopher the status of the analogy. After this, it is discussed which features are genuinely comparable and which are merely an external impression. Such a format will show how the hypothesis works in practice and where its boundaries lie.

Another example is the analysis of a radial-layered form: flower, crater, nebula, mandala. A biologist explains the flower, a geologist the crater, an astrophysicist the nebula, an art historian or scholar of religion the mandala, and a mathematician the radial and layered parameters. As a result, it becomes possible to separate common morphological features from mechanisms, functions and cultural meanings. Such work is especially important so that the hypothesis does not turn into a simple visual bringing together of heterogeneous objects.

Expert review should also include an assessment of language. Sometimes the risk of the hypothesis arises not from the idea itself, but from overly strong formulations. Specialists may indicate where “proves” should be replaced with “may be considered”, “is” with “demonstrates features of”, “universal scheme” with “morphological profile”, and “ancient knowledge” with “a cultural form allowing morphological reading”. Such editorial work has scientific significance, because precision of language protects the hypothesis from misreading.

Particular attention must be paid to the status of illustrations. Experts must assess which images may be used as scientific material, which only as illustrations, which require replacement, which are too artistically processed, and which need a source, scale or explanation. This is especially important for cosmic and cultural images. If an illustration is highly striking but lacks a clear source or status, it cannot be used as evidential material. The atlas should contain different levels of visual status: data, scheme, reconstruction, model and artistic illustration.

Interdisciplinary expertise will also help determine which directions of research are most promising. Specialists may indicate that the most testable part of the hypothesis is the analysis of branching networks through graph parameters. Or that radial-layered structures are best suited to morphometry. Or that the cultural block should be temporarily limited because of the complexity of interpretation. Or that the cosmological block requires special data, not popular images. Such recommendations will help build a realistic programme of work.

It must be understood that different experts may assess the hypothesis differently. A biologist may recognise the usefulness of the morphological language, but reject overly broad analogies with the cosmos. A geologist may support the analysis of river networks, but take a critical view of comparing craters with lotuses. An astronomer may accept parametric analysis of spirals, but reject figurative analogies. A cultural studies scholar may agree with the morphological reading of an ornament, but demand strict historical qualifications. Such divergences are normal. They do not destroy interdisciplinarity, but make it real.

For the further development of the hypothesis, not only agreement but also qualified objections are especially valuable. An objection from a specialist shows where a concept must be clarified, a conclusion limited, data strengthened or an example changed. If a geologist says that a particular structure is not a fault, this must be taken into account. If an astronomer says that the visible shell of a nebula is connected with image processing, this is important. If an archaeologist points to an incorrect attribution of an artefact, the interpretation must be changed. A scientific programme is strong when it is able to learn from criticism.

Interdisciplinary review must also end not only with comments, but with an update of the model. After expert assessment, the classifier, glossary, atlas, mathematical parameters, scales of evidentiality and list of strong examples may be changed. For example, some terms may receive more precise definitions. Some images may be transferred from the evidential corpus to the illustrative corpus. Some analogies may be recognised as weak. Some new types of forms may be added. Thus, expert review must have real consequences for the structure of the hypothesis.

In the longer term, a permanent expert group on the comparative morphology of the Matrix could be created. It could include representatives of different disciplines working with a common atlas and classifier. Such a group could annotate images, discuss contentious cases, develop the mathematical model, prepare publications, organise seminars and create a digital database. This would allow the hypothesis to move beyond the author's research and become a collective research direction.

It is especially important that the expert group should not be ideologically oriented only towards confirming the hypothesis. It should include not only supporters of the idea, but also critically minded specialists. This will help avoid a closed system of like-minded people. Genuine testing requires an external view. The stronger the criticism that the hypothesis is capable of withstanding, the higher its scientific potential. If, however, it can exist only among people who agree with it in advance, its research value will be limited.

Interdisciplinary expert review must be connected with a publication strategy. Separate parts of the hypothesis may be presented in different formats: articles on the morphometry of leaves and river networks, works on the classifier of invariants, studies of radial-layered structures, methodological publications on the atlas, philosophical articles on the concept of the Matrix, and cultural studies works on the cautious interpretation of artefacts. This path will make it possible to obtain specialised criticism and gradually strengthen individual elements of the hypothesis.

An important outcome of expert review may be the division of the hypothesis into several research modules. For example: a module of comparative morphometrics of natural forms; a module of graph analysis of branching networks; a module of radial-layered structures; a module of the active edge; a module of cultural morphology; a module of mathematical modelling of A–B–C–D; and a module of computer vision. Such division will make the work more manageable. Each module can be tested separately and then connected with the general philosophical framework.

Interdisciplinary review will also help determine which claims of the research have different statuses. Some propositions may be left as philosophical. Others may be methodological. A third group may be testable empirical hypotheses. A fourth may be illustrative analogies. A fifth may be contentious and require further work. Such status analysis is especially important for the final version of the project, because it will prevent the mixing of levels of evidence. The book will be stronger if it itself shows which of its elements are already sufficiently substantiated and which are part of a programme of future research.

Ultimately, expert review is needed so that the hypothesis does not remain a solitary intellectual construction. Any serious scientific programme must pass through external criticism, clarification of concepts, testing of data, discussion of methods and correction of conclusions. The Hypothesis of the Unified Matrix of the Universe may be large in scale and philosophically bold, but precisely for that reason it especially needs testing. The broader the design, the higher the requirements for rigour.

The conclusion of Chapter 27 may be formulated as follows. The scientific programme for further research should include the creation of an atlas of morphogenetic forms, the development of a classifier of invariants, the construction of a mathematical model of the transition from the circle-seed to a multilayered structure, testing on independent samples, and interdisciplinary expert assessment. These five directions form the path from concept to research practice. The atlas collects the material. The classifier turns images into features. The mathematical model describes the possible dynamics of form. Independent samples test the stability of analogies.

Expert assessment protects the hypothesis from errors, mystification, hyperinterpretation and disciplinary inaccuracy.

The conclusion of this section may be formulated as follows. Interdisciplinary expert review is a necessary condition for the further development of the Hypothesis of the Unified Matrix of the Universe. To test it, specialists in biology, geology, cosmology, mathematical modelling, computer vision, philosophy, cultural studies, archaeology and art history must be involved. Their task is not simply to confirm the idea, but critically to assess the material, terms, methods, images, classifier, mathematical model and levels of evidence. Only through such testing will the hypothesis be able to move from an authorial concept to a more stable, open and scientifically discussable research programme.

Conclusion

1. The Principal Outcome of the Study

The principal outcome of the study is that the hypothesis of the Unified Matrix of the Universe makes it possible to regard form not as an arbitrary external shell of things, but as the result of a process of self-organisation recurring at different levels of reality. Throughout the study, it has been demonstrated that living, geological, cosmological, cultural and experimental forms may be compared not according to their origins or mechanisms, but according to particular morphological relationships: centre, axis, layer, shell, branching, active edge, fractal complexity, radiality, spirality, opening and the return to a new potentiality.

In this sense, the study proposes not merely that natural and cultural objects possess external similarities, but a deeper understanding of form as process. Form is understood here not only as a final result visible in a photograph, artefact, relief, flower or nebula. It is understood as an unfolding: a transition from a closed potential state to a more complex, multilayered, self-similar, structurally stable organisation capable of further reproduction. This transition constitutes the central morphogenetic line of the hypothesis.

Within the study, this transition has been expressed through the A–B–C–D model:

- stage A designates closed potentiality: a seed, circle, bud, shell, nucleus, initial region or hidden structure;
- stage B is connected with the first disruption of closure: the appearance of an axis, crack, shoot, front, line of opening, initial layer or directed movement;
- stage C represents the manifested form: a flower, leaf, network, branching structure, multilayered structure, radial composition, active edge or fractal complexity;
- stage D indicates reproduction, a new centre, fruit, seed, node, daughter form or transition to the following cycle.

This scheme is not a universal mechanical formula, but it helps describe a recurring type of morphogenetic dynamic.

One important conclusion of the study is that this dynamic may manifest itself in different regimes. In some cases, radial-layered organisation predominates: the flower, lotus, mandala, crater, nebula and protoplanetary disc. In others, the axial-network type predominates: the leaf, tree, root system, mycelium, vascular network, drainage basin, fracture structure and cosmic filament. A third group consists of fractal-edged forms: coastlines, leaf edges, chemical fronts, nebulae, clouds, microbial colonies and ornamental boundaries. A fourth group consists of the folded-opening type: the bud, folded leaf, geological fold, opening shell and artefact as a record of internal structure.

At the same time, the study consistently emphasises that similarity of form does not imply identity of cause. This is one of its principal methodological conclusions. A leaf, river and cosmic network may be compared as branching structures, but they are not formed by the same mechanism. A flower, crater and nebula may exhibit centres, layers and active edges, but they are not variants of one physical system. An artefact may resemble biological or cosmological

opening, but it remains a cultural object with its own historical context. The hypothesis of the Matrix must therefore be understood as a hypothesis concerning the recurrence of structural relationships rather than as a claim that every form possesses a single cause.

Another principal outcome is that the concept of the Matrix has gradually been separated from mystifying and indeterminate meanings. Within the present study, the Matrix is not a hidden force, secret energy, supernatural programme or mystical code. It is understood as a structural logic of form—that is, as a hypothetical system of recurring morphological invariants and transitions. This approach preserves the philosophical scale of the idea without transforming it into an untestable claim. The Matrix becomes not a dogma, but an operational concept of comparative morphology.

The language of form introduced in the study is particularly significant. The terms ‘circle-seed’, ‘closed potentiality’, ‘opened form’, ‘active edge’, ‘morphogenetic axis’, ‘structural invariant’, ‘morphological profile’, ‘radial-layered structure’, ‘axial-network type’, ‘fractal-edged form’ and ‘folded-opening type’ make it possible to describe objects not only figuratively, but analytically. This language helps replace the impression that forms ‘look alike’ with more precise questions: which features correspond, how are they organised, can they be measured, how stable are they, and where do the boundaries of the analogy lie?

Another important result is that the hypothesis permits formalisation. It does not have to remain merely a philosophical metaphor. It may be developed through morphometry, fractal analysis, graph models, numerical modelling, reaction–diffusion systems, L-systems, folding and opening models, statistical testing and computer vision. The hypothesis therefore possesses not only a philosophical but also a methodological perspective. It can be tested, refined, limited, strengthened or reconsidered on the basis of data.

The study examined several blocks of material. The biological block demonstrated that living forms provide the clearest examples of growth, opening, branching, layering and reproduction. The geological and geophysical block demonstrated that non-living terrestrial matter also creates complex structures: river networks, folds, faults, craters, coastlines, dunes, relief and fields of anomalies. The cosmological block extended the question to the largest possible scales: nebulae, galaxies, supernova remnants, protoplanetary discs and filamentary structures. The cultural block demonstrated that human beings record and reinterpret the forms of the world in artefacts, ornaments, symbols, sacred geometry and images of the tree and lotus.

The general conclusion from this material is not that all these levels are identical, but that they may share a common language for describing form. Biology, geology, cosmology and culture possess different mechanisms, scales and modes of existence. They may nevertheless all demonstrate relationships between centre and periphery, axis and branching, layer and shell, closure and opening, edge and environment, repetition and difference, stability and transformation. These relationships constitute the field of the hypothesis of the Unified Matrix of the Universe.

In this sense, the study proposes that the world should be regarded not as a collection of isolated objects, but as a multiplicity of processes of form generation. Form does not simply exist within the world; it arises, opens, becomes more complex, interacts with its environment, achieves stability, disintegrates, reproduces and enters new cycles. A seed becomes a shoot, a bud becomes a flower, a flower becomes a fruit, a crack becomes a fault network, a reaction front becomes a pattern, a central point becomes a mandala, and a compact structure becomes a complex shell. Even where direct biological growth is absent, the becoming of form may be discussed as a process of structural organisation.

The principal outcome of the study may be expressed through the following formulation: the hypothesis of the Unified Matrix of the Universe proposes that form should be regarded as the result of a universalisable but non-uniform process of self-organisation in which a closed potential state transitions into a multilayered, self-similar, structurally stable and reproducible form. The word ‘universalisable’ is especially important here. It does not mean that the same mechanism operates within every system. It means that a particular logic of transition may be described at different levels through comparable morphological features.

This understanding makes it possible to connect the different sections within a single framework. The early chapters introduced the Matrix as a structural principle of form. The chapters concerning biological, geological and cosmological analogies presented material for comparative morphology. The chapters concerning artefacts, the World Tree, Sumerian bas-reliefs, sacred geometry and the lotus demonstrated the cultural dimension of form. The chapters on testability, modelling and experimental directions transferred the hypothesis into the methodological domain. The concluding chapters identified its strengths, risks, limitations and programme for further research. The book has consequently constructed not a closed doctrine, but an extended research trajectory.

The principal outcome of the study also lies in a changed understanding of form itself. Form ceases to be a secondary characteristic of an object. It becomes a mode through which order exists. Through form, it is possible to perceive how matter, life, relief, the cosmos and culture organise themselves into stable structures. Form makes it possible to compare phenomena that usually belong to separate disciplinary worlds. It allows movement from image to parameter, from symbol to structure, from observation to model and from philosophical intuition to a scientific programme. This is what makes the hypothesis of the Matrix productive.

The study does not, however, claim to have discovered a definitive law of the Universe. On the contrary, its principal outcome is the formulation of a broad but methodologically delimited question: do recurring morphological invariants exist that manifest themselves in different systems governed by different mechanisms and can be described using a shared language? Answering this question still requires further research. The possibility of posing it rigorously is nevertheless already an important result.

The principal outcome of the study may therefore be formulated as follows: the hypothesis of the Unified Matrix of the Universe proposes a conceptual and methodological framework for studying form as a process of self-organisation, opening and reproduction of structural invariants. It combines visual persuasiveness, philosophical depth and the possibility of formalisation. Its value lies not in conclusive proof, but in creating a new field of inquiry within which biological, geological, cosmological and cultural forms may be compared cautiously, analytically and openly, subject to further testing.

2. The Scientific Status of the Hypothesis

The scientific status of the hypothesis of the Unified Matrix of the Universe must be defined with the greatest possible precision and caution. Following the research undertaken in this study, it would be methodologically incorrect to present the hypothesis as a completed and conclusively proven theory. The book proposes a broad concept, substantial comparative material, a system of concepts, a set of morphological features, directions for formalisation and a programme for

future testing. This does not yet mean, however, that the hypothesis has acquired the status of a rigorous scientific theory in the fullest sense. At present, it is more accurate to describe it as an interdisciplinary research programme at the stage of conceptual and methodological development.

This definition is fundamentally important. A completed theory must possess a stable conceptual apparatus, tested models, reproducible results, an empirical foundation, statistical support, clearly defined limits of applicability and recognised testing procedures. The hypothesis of the Matrix is only progressing towards this state. It formulates a problem, proposes a language for describing form, identifies possible invariants, demonstrates visual and morphological parallels and outlines methods of analysis. Many of its propositions, however, still require independent testing, expert evaluation, terminological refinement and translation into measurable parameters.

The hypothesis should therefore not be interpreted as a proven law of the Universe. Such an approach would be not only premature, but also dangerous to the idea itself. If the hypothesis were presented as a final truth, it would immediately become vulnerable to criticism: visual analogies could be accused of subjectivity; cultural interpretations of overinterpretation; the concept of the Matrix of indeterminacy; and cross-scale comparisons of excessive analogising. It is considerably stronger and more honest to define it as an open research programme that proposes testable directions without claiming that every answer has already been obtained.

The scientific status of the hypothesis may be described through several levels.

The first is the philosophical-conceptual level. Here, the Matrix is understood as the idea that structural relationships of form recur at different levels of reality. This is the level at which the question is posed: can form be regarded as a universal language of self-organisation?

The second is the comparative-morphological level. Here, specific objects are analysed: the seed, bud, flower, leaf, relief, river network, crater, nebula, galaxy and artefact.

The third is the methodological level. Here, the morphological profile, classifier of invariants, atlas of forms and analytical criteria are introduced.

The fourth is the formalisable level. This is connected with morphometry, fractal analysis, graph models, numerical modelling, statistics and computer vision.

These levels must not be conflated.

At the philosophical-conceptual level, the hypothesis has already been developed to a considerable extent. It proposes a clear central idea: form may be regarded as a process through which structural invariants unfold, moving from closed potentiality towards an opened, multilayered, self-similar and reproducing organisation. This idea is internally coherent and makes it possible to unite material from different chapters. Philosophical coherence, however, is not equivalent to empirical proof. It creates a framework, but does not replace testing.

At the comparative-morphological level, the hypothesis also possesses considerable potential. The book demonstrates that comparable features can genuinely be identified among different objects: centre, axis, branching, layer, shell, active edge, radiality, spirality, fractal complexity and degree of opening. A substantial proportion of these comparisons nevertheless remains preliminary. They are persuasive as observations and as a formulation of the problem, but require systematic testing on large and independent samples. This constitutes the boundary of the hypothesis’s current scientific status.

At the methodological level, the hypothesis takes an important step forward because it is not confined to images. It proposes the creation of an atlas of morphogenetic forms, a classifier of invariants, a morphological profile for every object, a mathematical model of the transition from the circle-seed to a multilayered structure, and systems for independent and expert testing. This transfers the hypothesis from the realm of free philosophical analogy into that of potential research practice. It is precisely the presence of a methodological programme that makes it possible to state that the hypothesis is not merely a metaphor.

At the formalisable level, the work is only beginning. Morphometry, fractal analysis, graph models, statistical tests, computer vision and numerical simulations have so far been presented as necessary directions for future research. They indicate the route through which the hypothesis may be strengthened. Until such testing has been conducted, however, its principal propositions cannot be described as confirmed in the rigorous scientific sense. Formalisation remains a prospect rather than a completed result.

The most accurate definition of the hypothesis's scientific status is therefore as follows: the hypothesis of the Unified Matrix of the Universe is an interdisciplinary conceptual and methodological research programme aimed at identifying, describing and subsequently testing recurring morphological invariants in natural, cultural and modelled forms. This definition preserves the scale of the idea without exaggerating its evidential status. It demonstrates that the hypothesis has a scientific orientation while still requiring further work.

An important indication of the hypothesis's scientific viability is its openness to testing. It must not be constructed in such a way that every observation automatically confirms the Matrix. On the contrary, the book has identified possible methods of criticising and refining it. If independent samples fail to confirm the stability of certain analogies, those analogies must be weakened. If morphometry demonstrates that particular forms are not parametrically close, they cannot be used as strong examples. If cultural expertise refutes particular interpretations of artefacts, those interpretations must be reconsidered. Such readiness to accept limitations is an essential condition of scientific status.

At least some components of the hypothesis must also be falsifiable. The entire philosophical idea cannot be proven or disproven through one experiment, but specific propositions can be tested. For example, authorial triads should demonstrate greater morphological proximity than random triads; branching structures at different levels should possess comparable graph parameters; radial-layered objects should form a stable morphological cluster; and the A–B–C–D model should be expressible through parameters of opening, layers, edge and the new centre. Such propositions can be tested. This makes the hypothesis scientifically discussable.

It should also be emphasised that the hypothesis does not claim to replace specific sciences. It does not replace biology, geology, astrophysics, archaeology, cultural studies or mathematics. Biological forms must be explained biologically; geological forms geologically; cosmological forms astrophysically; and cultural forms historically and culturally. Correctly understood, the Matrix is not a universal cause. It is a proposed level of structural description that may be superimposed upon different disciplinary materials after those materials have been analysed on their own terms. This is an important boundary of the hypothesis's scientific status.

This position makes the hypothesis interdisciplinary without making it reductionist. It does not reduce the world to a single scheme. It proposes a language through which recurring morphological relationships may be sought among different systems. This distinction is fundamental. A reductionist version would claim that everything originates from a single Matrix

and is therefore identical. A scientifically cautious version states that comparable structural invariants may manifest themselves within different systems governed by different mechanisms and that these invariants require description and testing. It is the second version that must be preserved as the principal one.

The scientific status of the hypothesis also depends upon the precision of its central concept. If the Matrix is understood vaguely as an undefined force, the hypothesis loses scientific robustness. If the Matrix is defined as a structural logic of form, it becomes an operational concept. This concept may be specified through invariants: centre, axis, layers, branching, active edge, opening, fractality, spirality and reproduction. The clearer this system of features becomes, the stronger the scientific status of the hypothesis will be. Further work should therefore focus primarily upon refining the terminology.

The distinction among metaphor, model and evidence is especially important. The study employs powerful images: the circle-seed, World Tree, lotus, opened bud, active edge and cosmic shell. These images are important to thought, but they must not replace evidence. A metaphor helps reveal a possible connection. A model makes it possible to describe that connection formally. Evidence requires data, measurements, testing and reproducibility. The scientific status of the hypothesis will depend upon the consistency with which metaphors can be translated into models and models into testable procedures.

In this respect, the hypothesis occupies a productive intermediate position. It has already progressed beyond pure metaphor because it proposes a classifier of features, a possible mathematical model, an atlas of forms and directions for testing. It has not yet become a completed theory because these instruments still require development and application. This intermediate position should be acknowledged honestly. The hypothesis is strong as a programme, but its evidential strength must increase gradually.

Such a status is not a deficiency. Many scientific fields began with broad conceptual frameworks that were subsequently refined, limited, formalised and tested. What matters is not that the hypothesis has yet to be proven conclusively, but whether it provides a path towards testing. In the present case, this path has been outlined with considerable clarity: an atlas of morphogenetic forms, a classifier of invariants, morphometry, fractal analysis, graph models, mathematical simulation, independent samples, computer vision and expert evaluation. This establishes its scientific prospects.

The eventual fate of the hypothesis may take several forms. Future research may confirm a substantial proportion of its propositions, in which case it may become the foundation of a new comparative morphology. Only individual elements may be confirmed—for example, analysis of the active edge, axial-network structures or radial-layered forms. The philosophical idea may survive as a productive framework while the universality of the Matrix is restricted. Certain cultural interpretations may prove too weak and be excluded. All these outcomes are permissible. A scientific programme must be prepared for refinement.

The hypothesis must therefore remain open rather than dogmatic. An open hypothesis permits development, criticism, refinement and partial revision. A dogmatic hypothesis declares itself to be true in advance. The present book favours the first path. It is more difficult because it requires weaknesses to be acknowledged honestly. It is, however, considerably stronger from a scientific perspective. A hypothesis that recognises its limitations has a greater chance of being accepted as a serious research project.

The scientific status of the hypothesis is also connected with its interdisciplinary character. It cannot be supported solely through philosophical argument or visual material. Testing it requires different forms of knowledge: biological data, geological maps, cosmological images, cultural sources, mathematical models, statistics and computer-vision algorithms. The hypothesis must therefore develop through collaboration among specialists. While it remains an authorial concept, its status is limited. Once it becomes the subject of interdisciplinary evaluation and testing, its scientific status may be strengthened substantially.

It is also important to recognise that the hypothesis possesses not only empirical, but also heuristic status. It is already valuable because it helps formulate new questions. Even if not all its propositions are confirmed, it proposes a direction of inquiry: how can forms at different levels be compared? How can the active edge be described? How can morphological invariants be classified? How can an atlas of forms be constructed? How can visual morphology, mathematical modelling and cultural interpretation be connected? In this sense, the hypothesis may remain productive even before conclusive testing.

This heuristic status should not be underestimated. Science develops not only through completed theories, but also through programmes that open new fields of observation. The hypothesis of the Matrix proposes form as a shared object of interdisciplinary analysis. It encourages closer attention to structures that are frequently considered separately: biological growth, relief, cosmic shells, artefacts, ornaments and numerical patterns. This already constitutes a scientifically significant result, even if further testing limits some of the conclusions.

Heuristic value must not, however, replace evidential support. This is another important distinction. The hypothesis may be productive while remaining incompletely supported. It may open new possibilities while requiring rigorous testing. It may be philosophically profound while requiring operational definitions. The most honest position is therefore to acknowledge both its value and its incompleteness. This is how its scientific status should be defined in the conclusion.

The hypothesis of the Unified Matrix of the Universe consequently occupies an intermediate but promising position. It already possesses an internal conceptual structure, terminology, a system of images, methodological proposals and a programme for future research. It still requires empirical strengthening, independent testing, mathematical development and interdisciplinary evaluation. It therefore cannot be presented as a completed theory. It should be understood as a research programme open to further development.

Thus, the scientific status of the hypothesis of the Unified Matrix of the Universe is that of an interdisciplinary research programme directed towards studying recurring morphological invariants in nature, the cosmos, culture and modelled systems, rather than that of a proven universal theory. Its strength lies in the possibility of progressing from visual analogy to morphological description, from description to formalisation and from formalisation to testing. Its future scientific value will depend upon the successful creation of an atlas of forms, classifier of invariants, mathematical model, independent samples and system of expert verification.

3. The Significance of the Hypothesis

The significance of the hypothesis of the Unified Matrix of the Universe lies above all in its proposal of a common language for describing processes of form formation. Throughout this

study, form has been considered neither as an external accident, nor as the decorative surface of an object, nor as a simple geometric configuration, but as an expression of internal structural organisation. This approach makes it possible to connect fields that are usually studied separately: the living world, geological processes, cosmic structures and cultural symbolism. The hypothesis does not erase the differences between these fields, but offers a way of discussing them through recurring morphological relationships.

The principal value of the hypothesis lies in its shift of attention from individual objects to the principles of form. Within this approach, a flower, leaf, tree, stone, river network, crater, nebula, galaxy, artefact or ornament is important not only in itself, but also as the bearer of particular structural features. Within them, one may seek a centre, axis, layers, branching, an active edge, an envelope, a spiral, fractality, radiality, a degree of opening, a relationship between the internal and external, and a transition from a potential state to a manifested form. This language makes it possible to discern recurring modes of organisation behind the diversity of objects.

It is especially important that the hypothesis makes it possible to unite visual thinking with analytical description. Many forms appear intuitively similar, but without a conceptual apparatus such similarity remains merely an impression. The introduction of such terms as ‘circle-seed’, ‘active edge’, ‘morphogenetic axis’, ‘structural invariant’, ‘morphological profile’, ‘radial-layered structure’ and ‘axial-network type’ constitutes a first step from visual recognition towards analysis. Readers and researchers acquire not merely a collection of images, but also tools for differentiation.

This constitutes an important methodological significance of the study. It demonstrates that visual analogy can be productive when it is not presented as proof, but used as the beginning of an investigation. If a nebula resembles a flower, this does not imply a causal relationship. It may, however, prompt the question of whether these objects possess comparable features: a centre, layers, an envelope, an active edge or a radial distribution. If a river network resembles leaf venation, this does not imply an identical mechanism, but it does permit a comparison of branching, nodes, the ordering of lines and the distribution of structure across an area. The hypothesis teaches us to move from an impression to a question.

The significance of the hypothesis is also connected with its proposal of an interdisciplinary framework. In contemporary science, many processes can no longer be considered solely within a single field. Self-organisation, pattern formation, fractality, nonlinear dynamics, morphogenesis, complex networks, scale invariance and visual structures require movement between disciplines. The Matrix hypothesis belongs to this intellectual context, but adds philosophical and cultural dimensions to it. It demonstrates that form may constitute a common subject for the natural sciences, mathematical modelling, the humanities and philosophy.

For biology, the significance of the hypothesis lies in its capacity to consider living forms not only as the results of genetic and physiological mechanisms, but also as morphological processes possessing structural stages. Seeds, shoots, buds, flowers, fruits, leaves, trees, mycelial networks, corals and vascular networks can all be described through transitions involving closure, opening, branching, layering, the active edge and reproduction. Such a language does not replace biology, but helps to connect diverse living forms within a unified comparative morphological perspective.

For geology and geophysics, the hypothesis is significant because it extends the concept of morphogenesis beyond the living world. Relief, river networks, faults, folds, craters, coastlines, the ocean floor and geophysical fields demonstrate that complex form also arises within non-

living matter. There is no biological growth here, but there are tectonics, erosion, sedimentation, rupture, flow, pressure, gravity, weathering and prolonged time. The hypothesis makes it possible to describe these structures through axes, branching, layers, edges, envelopes and fractal complexity without replacing geological mechanisms with biological metaphors.

For cosmology, the value of the hypothesis lies in posing the question of morphology at the largest scales. Nebulae, galaxies, gas-and-dust clouds, supernova shells, protoplanetary discs and cosmic filaments are often perceived as remote and inaccessible structures. Yet within visual and morphological analysis, they too may be described through centres, layers, spirals, filaments, active edges, envelopes, asymmetries and distributions of matter. The hypothesis does not turn the cosmos into a symbolic extension of biology, but allows cosmic structures to be incorporated into a common language of form.

For cultural studies, archaeology and art history, the hypothesis is important because it proposes that artefacts and symbols be considered not only as bearers of meaning, but also as forms that record particular modes of organisation. The World Tree, lotus, mandala, Sri Yantra, ornament, bas-relief, circle, star, wave, staff, vessel and geometric composition may be analysed through the axis, centre, layers, opening, repetition, active edge and structural hierarchy. Their cultural context must nevertheless be preserved. The significance of the hypothesis lies not in replacing historical interpretation, but in adding a morphological level to it.

This approach is especially valuable because it makes it possible to regard culture as an autonomous level of form formation. Human beings do not merely observe natural forms; they transform them into signs, images, ritual objects, ornaments, architecture, diagrams and symbolic systems. Culture intensifies, generalises, idealises and structures impressions derived from nature. In this sense, cultural symbolism may be considered a distinct domain in which morphological invariants are recorded. Such recording, however, is not direct proof of the Matrix; it constitutes material for careful comparative analysis.

The philosophical significance of the hypothesis lies in its restoration of ontological seriousness to form. In contemporary thought, form is often understood as appearance, surface structure or a means of classification. In this study, form is considered more profoundly: as a mode through which order manifests itself, as a result of interaction between the internal and external, as the dynamics of opening, and as a relationship between potentiality and manifestation. This perspective makes it possible to speak of a morphology of being—not in a mystical, but in a philosophical and analytical sense. The world appears not as a collection of accidental appearances, but as a field of processes through which structure becomes visible.

The hypothesis is also significant for the development of a theory of visual knowledge. Science increasingly works with images: microscopic photographs, satellite maps, digital elevation models, astronomical images, medical visualisations, archaeological reconstructions and computer simulations. Yet images require a language of analysis. The Matrix hypothesis proposes one possible language: an image should be read through its centre, axis, layers, edge, branching, fractality, radiality, degree of opening and morphological profile. This may prove useful not only for the present study, but also for the broader field of visual epistemology.

The methodological value of the hypothesis lies in its proposed path from image to data. First comes visual observation. Features are then identified. A classifier is subsequently created, followed by an atlas, a morphological record, a mathematical model, independent samples and expert review. This sequence demonstrates how philosophical intuition may gradually be translated into research practice. This is important because many broad ideas remain confined

either to the realm of metaphor or to that of declaration. Here, however, a path towards verification has been outlined.

The educational significance of the hypothesis is equally apparent. It provides a visually accessible means of explaining complex ideas of self-organisation, morphogenesis, fractality, branching, symmetry, layering, the active edge and the structural invariant. A flower, leaf, tree, river, stone, nebula, galaxy or ornament becomes not merely an example, but an educational point of entry into complex scientific and philosophical concepts. Such an approach may be useful in interdisciplinary education, scientific visualisation, the popularisation of complex systems and the development of visual thinking.

The significance of the hypothesis should not, however, be understood as proof of its universality. An idea may possess considerable value even before its final verification. It may be useful as a language, method, programme, means of formulating questions or direction for research. The hypothesis should therefore be evaluated not only in terms of its present degree of substantiation, but also according to its heuristic power. It opens a field in which new connections may be sought, concepts refined, models constructed, analogies tested and comparative morphology developed.

Particularly important is the hypothesis's capacity to preserve similarity and difference simultaneously. A weak version of such an idea might claim that everything in the world is the same. The strong version argues differently: different systems possess different mechanisms, but certain structural relationships may recur. This makes it possible to preserve scientific specificity while also seeking invariants across different levels. Such a position is especially valuable in an era when science increasingly faces the need to compare complex structures of different origins.

The hypothesis is also significant as a critique of a purely fragmented view of the world. Disciplinary knowledge is essential, but it sometimes divides reality into disconnected domains. The biologist sees an organism; the geologist, relief; the astronomer, a galaxy; the cultural scholar, a symbol; and the mathematician, a model. The Matrix hypothesis asks whether these domains might display not causal identity, but morphological correspondence. This does not abolish specialisation, but creates a space for dialogue.

In this sense, the significance of the hypothesis lies not only in its content, but also in its style of thought. It requires us to observe attentively, compare cautiously, avoid premature conclusions, distinguish between levels of analogy, acknowledge limitations, translate images into features and test intuitions against data. Such a style of thought is itself important. It unites imagination with discipline, breadth with precision, and philosophical boldness with methodological caution.

The practical significance of the hypothesis may be manifested in the creation of a morphological atlas, a digital classifier, an image database, educational materials, computational tools for analysing form and interdisciplinary research projects. It may provide a basis for seminars, visual courses, comparative studies, philosophical discussions and experimental programmes. Even if some of its propositions are subsequently refined or restricted, the resulting infrastructure for the analysis of form may itself prove useful.

The concept of the active edge is of particular significance. It may become one of the study's most productive terms. The active edge makes it possible to analyse a boundary not as the passive termination of an object, but as a site of interaction, growth, destruction, opening and exchange. The term is applicable to biology, chemical patterns, geology, cosmology, culture and numerical models. It demonstrates that a form derives its dynamism not only from its centre, but also

through its boundary. This idea may possess independent significance for a future philosophy of form.

The concept of the morphological profile is no less significant. It makes it possible to move beyond general assertions of similarity and describe an object through a set of features. If the hypothesis is developed further, the morphological profile may become the basis for a digital atlas, statistical analysis and computational form recognition. This concept translates a philosophical idea into an analytical system. It makes comparison possible on the basis of structure rather than impression.

The value of the hypothesis also lies in its acknowledgement of the need to test its own foundations. The book explicitly identifies its risks: excessive analogising, mystification, indeterminacy in the concept of the Matrix, cultural overinterpretation and the problem of provability. This makes the project more mature. A hypothesis that recognises its weaknesses has a greater chance of developing. It does not close the discussion, but opens it. This constitutes an important scientific and philosophical merit.

Thus, the significance of the hypothesis of the Unified Matrix of the Universe cannot be reduced to a single proposition. It is important as a philosophical idea of form, a language of comparative morphology, an interdisciplinary framework, a method of visual analysis, a programme of formalisation, an educational instrument and a direction for future scientific work. Its strength lies in its capacity to connect different levels of reality without simplistically identifying them with one another. It proposes that form be understood simultaneously as process, structure and meaning, while requiring every specific claim to be tested.

The significance of the hypothesis of the Unified Matrix of the Universe lies in its proposal of a common language for describing processes of form formation in the living world, geology, the cosmos and cultural symbolism. This language is organised around the concepts of centre, axis, layers, branching, the active edge, opening, fractality, the structural invariant and the morphological profile. The hypothesis is valuable not as a conclusively proven theory, but as a productive research framework capable of uniting visual intuition, philosophical thought, interdisciplinary analysis and future formal verification.

4. Future Prospects

The future development of the hypothesis of the Unified Matrix of the Universe depends upon its gradual transition from a conceptual framework to a fully developed research programme. This book has formulated its principal concepts, proposed key morphological invariants, examined visual and cultural materials, and identified risks and limitations. Further work, however, must move beyond authorial description towards the systematic collection of data, formalisation, independent verification and interdisciplinary expert review. Only in this way can the hypothesis strengthen its scientific status.

The first promising direction is the creation of a morphological atlas. Such an atlas should bring together images of seeds, buds, flowers, leaves, trees, mycelial networks, corals, stones, geodes, relief forms, river networks, the ocean floor, craters, nebulae, galaxies, artefacts, ornaments and experimental patterns. Its purpose should not be merely to demonstrate visually attractive similarities between forms, but to create a corpus of data in which every object is

described according to a unified morphological record. The atlas should document the source of each image, its scale, data type, context, formal features and level of interpretation. It could thereby provide the foundation for the subsequent testing of the hypothesis.

The second direction is the development of a classifier of morphological invariants. For each image, it will be necessary to record the centre, axis, layers, radiality, edge, spiral, branching, fractality, degree of opening, envelope structure, symmetry, asymmetry and possible relationship with the A–B–C–D model. Such a classifier would make it possible to move from impression to structural description. It should indicate not only the presence of a feature, but also its degree of expression, type, level of confidence and domain of applicability. Without such an instrument, the hypothesis risks remaining visually persuasive but analytically insufficiently rigorous.

The third direction is the creation of a mathematical model. The book has already outlined the idea of a transition from the circle-seed to a multilayered structure. In future, this idea should be developed into a formal system of parameters: closure, centredness, degree of opening, number of layers, edge activity, degree of branching, fractal complexity, spirality and the probability that a new centre will emerge. Such a model should describe not a single universal pattern, but a space of possible morphogenetic trajectories. Some trajectories would lead to radial-layered forms, others to axial-network forms, still others to fractal-edged or folded-opening forms.

The fourth direction is fractal and graph analysis. Fractal analysis would make it possible to test edge complexity, self-similarity and scale invariance. Graph analysis would help to describe branching and network structures: leaves, roots, mycelial networks, vascular systems, river networks, cracks, faults, cosmic filaments and ornamental networks. These methods are particularly important because they permit forms to be compared through numerical and topological parameters rather than external impression. It is through such instruments that the hypothesis may acquire a more rigorous analytical foundation.

The fifth direction is computational form recognition. Artificial intelligence and computer vision may help to process large image datasets and identify contours, centres, axes, layers, branches, active edges, spirals and fractal features. Algorithms may construct morphological vectors, group objects into clusters, compare the author’s triads with randomly assembled triads, and identify strong and weak analogies. AI, however, should be used not as a source of authority, but as an analytical instrument. Its conclusions must be interpretable, verifiable and comparable with expert assessments.

The sixth direction is testing on independent samples. This is an essential condition for the scientific robustness of the hypothesis. Images should be selected not only by the author, but also according to predetermined external criteria: a random sample, catalogue, region, database, museum collection, astronomical archive or satellite dataset. Only in this way can confirmation bias in sample selection be avoided. If the proposed invariants remain present in independent samples, the hypothesis will receive support. If they do not, it will need to be restricted, refined or reconsidered.

The seventh direction is interdisciplinary expert review. The further development of the hypothesis will require biologists, geologists, geophysicists, oceanographers, astronomers, mathematicians, complex-systems specialists, programmers, philosophers, cultural scholars, archaeologists, art historians and scholars of religion. Each specialist should assess the relevant body of material and indicate where the morphological reading is valid and where it exceeds the limits of permissible interpretation. Such review is especially important for cultural artefacts and

cosmological images, where the risks of overinterpretation and visual mystification are particularly high.

The eighth direction is the development of a philosophical theory of the morphology of being. This is the broadest and most long-term prospect. If further research confirms even some of the proposed invariants, it may become possible to speak of form not only as a geometric or biological characteristic, but also as a fundamental mode through which order manifests itself. A morphology of being understood in this way should investigate how potentiality becomes structure, how a boundary becomes an active edge, how a centre generates a periphery, how a layer records time, how branching distributes a flow, how form preserves stability and how it returns to a new cycle.

Such a philosophical theory must not be mystical. It should be grounded in data, models, images, classifications and verifiable features. Its purpose should not be to proclaim the Matrix a mysterious force, but to comprehend the recurrence of structural relationships throughout the world. If biology, geology, cosmology, culture and modelling genuinely display stable correspondences of form, philosophy must ask what this means for our understanding of order, matter, life, symbols and human perception. It is here that the hypothesis may attain the level of a profound philosophical morphology.

The future of the hypothesis is also connected with the refinement of its language. The terms proposed in this book must be tested through practical application. Some of them may prove particularly productive: the active edge, morphological profile, circle-seed, morphogenetic axis and structural invariant. Others may require refinement or restriction. A future glossary of the Matrix should become not a decorative vocabulary, but a working instrument of analysis. Each term should possess a definition, visual examples, measurable features, a domain of application and clearly stated limitations.

The further development of the hypothesis may lead to the creation of a digital platform for comparative morphology. Within such a system, images from different levels would be stored together with their morphological records, segmentation results, measurements, expert commentaries and classifications. Researchers would be able to search for objects by feature, compare morphological profiles, construct clusters, test triads, examine negative cases and add new material. This would transform the hypothesis from a text into a living research environment.

From an educational perspective, the hypothesis could provide the foundation for an interdisciplinary course on form, self-organisation and visual thinking. It could demonstrate the connections between botany, geology, cosmology, culture, mathematics and philosophy. Such a course could teach students to perceive form structurally rather than superficially: to identify the centre, axis, layer, active edge, branching, self-similarity, opening and the boundary of analogy. This is particularly important in a world where visual data are becoming one of the principal languages of science.

At the same time, the future of the hypothesis must remain open. It cannot be assumed in advance that subsequent research will confirm every aspect of it. Particular elements may receive the strongest support: the analysis of branching structures, active edges, radial-layered forms or the model of opening. The cultural block may require stricter limitations. Cosmological analogies may prove robust only for certain types of objects. The mathematical model may be useful as an instrument for generating forms, but not as a universal scheme. All of these outcomes are legitimate. A scientific prospect does not require guaranteed confirmation in advance.

The strongest prospect lies precisely in a willingness to refine the hypothesis. If it is to develop with intellectual honesty, it must accept limitations as well as confirmations. It must be capable of excluding weak analogies, reconsidering its terminology, modifying its classifier, refining its model, acknowledging the boundaries of cultural interpretation and distinguishing between different levels of evidence. Even partial verification would then be useful. The hypothesis could become not a dogma about the unity of everything, but an instrument for investigating how different forms in the world sometimes display comparable structural relationships.

The principal long-term prospect is the creation of a new comparative morphology. Such a morphology could study not only individual forms within a single discipline, but also structural invariants across different levels: the living, non-living, cosmic, cultural and modelled. It could unite morphometry, complex-systems theory, visual epistemology, the philosophy of form, the digital humanities and computer vision. The hypothesis of the Unified Matrix of the Universe could become one step towards establishing such a field of inquiry.

By way of philosophical conclusion, it may be said that the future of the hypothesis is connected with a more attentive way of looking at the world. The world appears not merely as a collection of objects, but as a multiplicity of processes through which form manifests itself. Things arise, open, branch, form layers, create edges, repeat motifs, disintegrate and return to new states. In observing these processes, human beings translate them into culture, symbols, images, rituals and models. The study of form therefore becomes simultaneously a study of nature, culture and the human mode of understanding the world.

Thus, the further development of the hypothesis of the Unified Matrix of the Universe is connected with the creation of a morphological atlas, a classifier of invariants, a mathematical model of the transition from the circle-seed to a multilayered structure, fractal and graph analysis, computational form recognition, testing on independent samples and interdisciplinary expert assessment. In a broader perspective, this work may lead to a philosophical theory of the morphology of being—a theory in which form is understood as a mode of self-organisation, manifestation and reproduction of structural order. The hypothesis does not complete this path, but opens it.

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