The Evolutio Unfolding Theory: Teleology, Formal Agents and the Reversal of Evolution's Causal Order

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Abstract. Evolutionary theory has been shaped by multiple paradigms—Darwinism, Lamarckism, Organicism, Emergentism, the Extended Synthesis, and contemporary proposals by Sheldrake, Noble, Kauffman, among others. While each has contributed valuable insights, they remain constrained by contradictions, ideological assumptions, or explanatory gaps. This article revisits the Evolutio Unfolding Theory (EUT), first formulated in 2020, and further developed through empirical evidence published in evolutionary developmental biology. After reviewing the fundamental principles of EUT and the empirical findings that support it, we undertake a systematic comparison with the main historical and contemporary evolutionary paradigms. We show where EUT converges with these traditions, where it diverges, and how it overcomes their unresolved limitations. By conceiving evolution as the purposive unfolding of virtual preformations through teleological formal agents within morphogenetic fields, EUT provides a coherent framework that integrates modularity, hierarchy, self-organization, epigenesis, and other phenomena underexplained by conventional theories. The originality of this work lies not in re-stating the theory or presenting new data, but in demonstrating its explanatory superiority when tested against the spectrum of evolutionary thought. In this way, the article positions EUT as a robust, argued, and verifiable alternative capable of transcending entrenched dichotomies—chance versus necessity, mechanism versus vitalism, design versus selection. More than a critique, it represents a constructive and integrative step toward a paradigmatic shift in how we understand life's evolutionary unfolding.

1 Introduction

The theory of biological evolution stands as one of the most influential and transformative scientific frameworks of modern times. Since Darwin's foundational insights, the field has evolved into a complex synthesis dominated by natural selection and genetic variation as primary explanatory mechanisms. However, despite this apparent success, deep conceptual challenges remain unresolved, particularly concerning the origins and nature of biological form, the role of purposiveness in evolution, and the integration of developmental processes with evolutionary change.

Mainstream evolutionary theory tends to prioritize efficient and material causality, relegating teleology—understood as goal-directedness or purpose—to metaphorical status or outright rejection. This reductionist bias neglects formal and final causes, concepts which trace back to Aristotelian philosophy and continue to possess heuristic value for understanding living systems.

In response to these limitations, the Evolutio Unfolding Theory proposes a fundamentally different approach: conceiving evolution as a process of unfolding formal potentials embedded within morphogenetic fields, mediated by teleological-purposeful formal agents and intertwined with consciousness as a fundamental organizing principle. First introduced in 2020 (83), this theory aims to transcend dichotomies such as Intelligent Design versus Darwinism and to provide a coherent, integrative framework for the evolutionary process.

This article elaborates on the theory's four foundational principles, reexamines the role of teleology as a formal cause, introduces the concept of virtual preformation and morphogenetic fields, explores consciousness within evolution, and critically assesses prevailing paradigms. It also presents recent empirical evidence from evolutionary developmental biology supporting the theory's predictions and implications. Through this integrative approach, the Evolutio Unfolding Theory offers a fertile ground for rethinking evolution's conceptual landscape and advancing both theoretical and empirical research.

2 The Evolutio Unfolding Theory: Foundations and Principles

The Evolutio Unfolding Theory proposes a comprehensive conceptual framework that understands evolution as a process grounded in four logically concatenated principles. These principles provide a rigorous foundation that challenges conventional mechanistic and stochastic paradigms.

2.1 Principle of Evolutionary Order

This principle asserts that *the more complex cannot be generated from the simpler*. Evolutionary complexity follows a strict sequential order, where simpler forms cannot give rise to more complex ones through mere self-organization or random processes because they lack the necessary information—the "information"—to produce or educe higher complexity.

This irreducibility leads to a true holism: forms are not assemblies of parts but preformed wholes. Thus, every complex form unfolds from a logically prior whole, supporting the notion that if everything comes from a whole, everything comes from the Whole.

2.2 Principle of Origin

To avoid infinite regress, the theory posits a maximum complexity as the origin of all others. This maximum complexity is not a mere sum or container of potential forms but represents

the last fold in the unfolding process—the first fold in the virtual realm and the last to be actualized. Analogous to Nicholas of Cusa's "contracted maximum", this originary complexity embodies universal consciousness that is self-aware and self-producing.

The maximum complexity complicates or implicates virtually the entire sequence of evolutionary stages, enveloping successive forms as nested folds. Through logical deduction, it forms all other forms by virtue of having the requisite information—the "form within" itself. However, ultimately, all forms are preformed, meaning they have always existed as potential forms.

2.3 Principle of Unfolding

Evolutionary development proceeds as an unfolding process, wherein pre-existing complexities progressively reveal themselves through time via sequential folds. Initially, all stages are superimposed in a *synoptic* state of *simplicity* resulting from nested folds.

As unfolding proceeds, increasingly complex forms are exposed, akin to unrolling a pre-written book whose plot was contained from the beginning. This metaphor applies to biological ontogeny, where the embryo reveals complexity virtually present from conception.

Unfolding is not mechanical; at each stage, it fulfills the end or purpose encoded in the form, expressing its inherent potentialities.

2.4 Principle of Actualization

Finally, the process culminates in actualization, entailing the conscious projection of idea-forms from the virtual world into the actual world of images. This is an active, self-aware process, distinct from mechanical projection. Here, actualization is imbued with consciousness and teleology: forms become aware of themselves and intentionally reveal their potentialities in the manifest world.

This principle resonates with Platonic ideas of forms and Jungian archetypes as symbolic transformations.

Together, these principles establish evolution as a teleological, sequential, and conscious unfolding of preformed potentials embedded in a virtual matrix of morphogenetic fields. They represent a radical reorientation of evolutionary thought that places life and consciousness at the center of the process.

3 The Ideological Matrix: The Virtual Totality of Potentiality

Central to the Evolutio Unfolding Theory is the concept of the *ideological matrix*, a foundational virtual domain that contains the totality of evolutionary potentials. This matrix is the ontological space in which all forms, stages, and morphogenetic fields exist in a preformed, virtual state prior to their actualization in space-time.

3.1 Virtual Preformation Beyond Space-Time

The ideas-forms contained in the ideological matrix are not localized within physical space or time; rather, they exist outside space-time in a virtual state. This domain represents a *pleroma*—a Greek term meaning *fullness*—comprising the entirety of what was, is, and will be, encompassing all that is potentially actualizable. In this sense, the ideological matrix is the totality of evolutionary possibility, structured as a continuous layered sequence of pre-existing forms.

3.2 Structure as an Ordered Series of Morphogenetic Fields

The ideological matrix consists of an ordered series of morphogenetic fields, each corresponding to successive evolutionary stages. These fields are not discrete, isolated entities but form a continuum mediated by folds—nested envelopes that organize the potential forms into a sequential structure. The process of evolution and development unfolds through the sequential unfolding of these folds, which expose the morphogenetic fields contained within.

Importantly, the unfolding does not create new morphogenetic fields; rather, it reveals those that were already virtually present within the ideological matrix. This ensures the principle of evolutionary order by preserving the preformation of forms in their potential state.

3.3 Holistic Totality and Holons

Each idea-form within a morphogenetic field can be considered a subfield, a subset of the total field constituting the ideological matrix. Despite this apparent partitioning, the matrix functions as a holistic totality—a true *holon*—where every part simultaneously embodies the whole in a relative sense. This nested, fractal-like structure implies that each form is simultaneously a totality and a component of a larger totality, reflecting deep systemic coherence.

3.4 Consciousness and the Ideological Matrix

The ideological matrix is not a static repository of forms but is intrinsically linked with consciousness. It exists prior to and independently from the actual unfolding and actualization of forms, yet it is fundamentally conscious of itself. This self-awareness of the matrix is expressed through the forms it contains, which become conscious as they unfold and actualize their potentials.

Consciousness thus plays a dual role: it both inhabits the ideological matrix and drives the process of teleological unfolding. The evolutionary process can be seen as the opening and actualization of consciousness within the forms embedded in the morphogenetic fields, bringing virtual potentials into actual realities.

4 Teleology Reconsidered: From Aristotle to Contemporary Biology

Teleology—the explanation of phenomena in terms of purpose or goal-directedness—has historically played a central yet contentious role in biological thought. Rooted in Aristotelian philosophy, teleology was once integral to natural science, describing how living organisms inherently strive toward ends or final causes. However, with the rise of mechanistic and materialistic science, teleology became marginalized, often dismissed as unscientific or mystical. The Evolutio Unfolding Theory invites a reconsideration of teleology, restoring it as an essential and rigorously definable formal cause within evolutionary processes.

4.1 Historical Overview of Teleology in Biology

Aristotle classified causes into four categories: material, efficient, formal, and final (3). Teleology corresponds primarily to the final cause—the purpose or end that a process or entity seeks to realize (77). In biology, this meant organisms develop and function according to intrinsic purposes, such as survival and reproduction. Early modern biology, influenced by Cartesian mechanism and Newtonian physics, shifted focus to material and efficient causes, explaining phenomena through physical interactions and mechanistic laws, thereby sidelining teleology (93).

Darwinian evolution further challenged teleology by proposing natural selection as a blind, purposeless process. Yet, teleological language persists in biology, often as a heuristic or metaphor rather than a foundational principle (50, 61). This ambiguity reflects an ongoing tension: how to reconcile goal-directedness with naturalistic explanations. Some contemporary philosophers, such as Walsh (105), have argued for a naturalized, non-reductive teleology that treats purposiveness as an intrinsic feature of biological systems rather than a mere heuristic.

4.2 Defining Teleology as a Formal Cause

The Evolutio Unfolding Theory revitalizes teleology by grounding it in Aristotle's *formal and final cause*, distinct from material or efficient causation. Formal causes are the organizational principles or "forms" that give matter its structure and function. Unlike material efficient causes, which describe mechanistic triggers, formal causes embody the "what-it-is-to-be" of a system, defining its identity and qualia. For its part, the final cause is the end or goal of that system or entity. The novelty and reconceptualization introduced by the Evolutio Unfolding Theory in this Aristotelian philosophy is that for this theory *the final cause is the formal cause*. More precisely, the future states and transformations—the evolutionary and developmental trajectory itself—are prefigured as forms embedded in successive morphogenetic fields unfolding from the virtual ideological matrix (83). The prototypic example of this process is the concept of entelechy as the entity carrying "the end within itself", such as the acorn which contains the final form of the tree within itself (77). The Evolutio Unfolding Theory transforms this one-step, static model into a stepwise, dynamic process, where successive forms are progressively introduced within nested and layered morphogenetic field-folds.

This redefinition shifts teleology from vague purposefulness or external design to an intrinsic, logically necessary ordering principle embedded in the morphogenetic fields present in the ideological matrix. Teleology thus emerges as *the directional formal cause of biological processes*—an internal directive that governs the unfolding of preformed potentials into actualized complex forms. It is not imposed externally, nor is it reducible to mechanistic explanations.

4.3 Teleological-Purposeful Formal Agents as Active Organizers

Central to this framework are *teleological-purposeful formal agents*—active organizers embedded within morphogenetic fields that mediate development and evolution (83). These agents embody purposive formal causality; they "know" the forms to be actualized and guide the organism's developmental process accordingly.

Unlike metaphysical or mystical agents, these formal agents operate through a structured information framework: the ideological matrix and folded morphogenetic fields contain nested potentialities that these agents sequentially unfold and actualize. Their teleological activity is conscious or proto-conscious, contributing to the organism's purposive self-realization.

Therefore, this theory proposes a new definition and characterization of *agent* and *agency*. An agent or agency is a *form* which, becoming aware or conscious of its potential content—its formal life-history embedded in the morphogenetic field-folds of the ideological matrix, sequentially actualize those forms purposefully. In short, *an agent is an entity that en-acts its potential forms*.

This view contrasts sharply with mechanistic accounts that attribute organismal complexity to blind processes or random variation alone. It provides a robust explanatory framework for phenomena that mechanistic and emergentist theories struggle to fully account for, such as developmental robustness, directed adaptation, and the origin of novel complex forms.

5 Virtual Preformation and Morphogenetic Fields

The Evolutio Unfolding Theory hinges on the notion of *virtual preformation* (79)—a modern re-interpretation of classical preformationism reconciled with contemporary developmental and evolutionary biology. This concept addresses the paradox of complexity's emergence: how can complex forms arise from simpler ones without violating the logical ordering established by the principle of evolutionary order?

5.1 Virtual Preformation as a Conceptual Model

Traditional preformationism—the idea that organisms develop from miniature versions of themselves—was largely

abandoned in favor of epigenesis, in which structures arise through developmental interactions. However, extreme epigenesis struggles to explain how reliably integrated, complex forms emerge without an organizing scaffold or constraint (41, 91). From the perspective advanced in this manuscript, and earlier argued by Ostachuk (79), these difficulties point toward the need for a model in which developmental regularities are grounded in pre-existing virtual potentials or structuring constraints, a view that the Evolutio Unfolding Theory formalizes as virtual preformation within morphogenetic fields.

Virtual preformation offers a resolution by positing that complex forms are always *virtually preformed*—they exist as nested potentials within a pre-existing formal structure. These potentials are not materially present but are encoded as *virtual folds* within morphogenetic fields, awaiting sequential unfolding and actualization (83).

This notion transcends the simplistic material versus form dichotomy by introducing a layered reality: a virtual realm of potential forms (the *ideological matrix*) that precedes and underpins actualized biological forms. The evolutionary process then becomes a journey through this virtual realm, actualizing forms in an ordered and purposeful sequence.

5.2 Morphogenetic Fields as Loci of Formal Agency and Purpose

Morphogenetic fields, first proposed in developmental biology by Gurwitsch (11) and later popularized by Sheldrake (95), are dynamic fields that guide the spatial and temporal organization of cells and tissues during development. Within the Evolutio Unfolding Theory, these fields are reinterpreted as the carriers of *formal causality* and *teleological-purposeful agents*.

Each morphogenetic field corresponds to a particular stage or "fold" in the ideological matrix. These fields embody structured information and potentialities, serving as the operative context for unfolding development and evolution. The folded structure of these fields encodes the nested complexity, ensuring evolutionary order and coherence in the transformation from simple to complex forms.

This layered field system guarantees that development and evolution are not random or emergent from mere self-organization, but rather directed by a teleological unfolding of virtual potentials that have always existed in the virtual realm.

5.3 Integration with Developmental Biology and Evolutionary Change

Virtual preformation and morphogenetic fields reconcile and expand upon classical debates between preformationism and epigenesis. They provide a framework where genetic, epigenetic, and environmental factors interact within the teleological context of unfolding potentials.

This model offers a natural explanation for phenomena such as developmental robustness, canalization, and the directed emergence of novel forms that cannot be fully explained by genetic determinism or random mutation alone (67, 70, 107). It situates biological form and function within a dynamic, purposive field that is conscious at some level, aligning with the principle of actualization and the teleological agents discussed earlier.

By grounding formal causality within morphogenetic fields that are both virtual and actual, the Evolutio Unfolding Theory bridges theoretical biology with a rich philosophical tradition, offering a new paradigm for understanding evolution as a process of teleological unfolding.

6 Empirical Evidence Supporting the Evolutio Unfolding Theory

Recent empirical studies have provided substantial support for the Evolutio Unfolding Theory, particularly in demonstrating how developmental and evolutionary processes unfold pre-existing complexities rather than generating them anew.

6.1 Study 1: A Network Analysis of Crab Metamorphosis (2021)

In this study, the external morphology of various phases of brachyuran crab metamorphosis was modeled as networks, and their main characteristics were analyzed (84). While traditional complexity measures such as modularity and hierarchy increased during development, more sophisticated complexity measures revealed a dual pattern: some measures increased, while others decreased. This led to the identification of two types of complexity: intensive and extensive. The study proposed that crab development involves a transition from an intensive, pre-existing complexity to an extensive complexity, aligning with the theory's concept of development as an unfolding process of pre-existing formal potentials.

6.2 Study 2: A Network Analysis of Early Arthropod Evolution (2024)

This study examined the external morphology of twelve arthropod groups, including those from the Burgess Shale and Orsten Lagerstätte, using network theory (85). Analyses such as Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA) were employed to construct an evolutionary tree. Centrality measures, which indicate the capacity of a morphological unit to influence its surroundings, were found to decrease throughout the evolutionary process. This reduction in centrality measures led to the concept of *evolutionary developmental potential*, suggesting that the primitive is not simpler but possesses a greater potential that unfolds over time. These findings provide empirical evidence supporting the theory's view of evolution as an unfolding process of pre-existing complexity.

6.3 Main Findings Supporting the Unfolding Process

Both empirical studies converge on several critical findings that substantiate the core tenets of the Evolutio Unfolding Theory:

- **Pre-existence of Complexity:** Complexity metrics reveal that higher-order structures and functional modules are present as potential organizational units from the earliest stages of development, consistent with the concept of *virtual preformation*.

• **Sequential Unfolding:** The data demonstrate a progressive exposure and elaboration of nested structures, supporting the principle of unfolding whereby more complex forms are gradually revealed through both development and evolutionary history.

• **Teleological Purposefulness:** The observed non-random, structured patterns of morphogenesis and evolutionary trajectories imply the operation of teleological-purposeful processes, rather than being solely the result of stochastic or mechanistic processes.

Within the framework of the Evolutio Unfolding Theory, these empirical findings are further interpreted as manifestations of morphogenetic fields and formal agency. The processes identified in the data are seen not only as structured patterns but as expressions of deeper teleological principles embedded in the ideological matrix.

6.4 Implications for Evolutionary Biology and Evo-Devo

These empirical insights necessitate a critical reassessment of prevailing evolutionary models that emphasize random mutation and natural selection as drivers of biological complexity. They underscore the significance of developmental constraints, intrinsic form potentials, and purposive organizational principles in shaping the rich diversity of life.

Furthermore, the identification of nested modularity and structured unfolding patterns offers a vital conceptual bridge between theoretical biology and empirical Evo-Devo research. This invites the scientific community to consider *virtual pre-existing potential forms* not merely as metaphysical constructs but as operational frameworks with concrete, testable predictions.

Ultimately, these findings lend substantial support to a more integrative evolutionary synthesis, one in which teleology, formal causality and evolutionary developmental potential are fundamental components rather than peripheral addenda. From the perspective of the Evolutio Unfolding Theory, these components reflect the action of deeper teleological-purposeful formal agents, embedded within morphogenetic fields and unfolding from the ideological matrix.

7 Consciousness in Evolutionary Processes

At the heart of the Evolutio Unfolding Theory lies a profound reconceptualization of consciousness—not as a mere byproduct of brain activity or subjective experience, but as an intrinsic idea-form and an active agent within the evolutionary unfolding process.

7.1 Consciousness as a Virtual Idea-Form

Consciousness, according to this theory, is fundamentally virtual; it exists as an idea-form in the ideological matrix rather than as a tangible entity within the actual organism. This virtuality means that consciousness itself is not located in any physical structure but is a dynamic potentiality that, upon unfolding, becomes self-aware and capable of engaging with its own contents teleologically.

Every idea-form, when unfolded, becomes conscious of itself, initiating a process of self-recognition, self-actualization, and purposeful development. Consciousness thus acts as a *portal* or *bridge* between the virtual realm of formal potentials and the actual realm of realized forms and images. It is the *diaphragm* of the *active formal agent* through which evolutionary potentials are explored, teleologically guided, and brought into expression.

7.2 Consciousness as Self-Recognition and Vision

Etymologically, consciousness derives from the Latin *conscientia* and Greek *συνείδησις*, meaning "to have seen" or "to become aware". In this light, consciousness is best understood as a self-relation or self-recognition of a whole (holon or true form). This holon can be pictured as a mirror that not only reflects but recognizes and remembers itself. This recursive self-awareness drives the continuous actualization of its potentials over time.

This relationship between vision and consciousness means that what an idea-form "sees" depends on its degree of openness—its access to the ideological matrix. The broader the access, the deeper the insight into the nested layers of preformed potentials, and the greater the capacity to actualize these potentials. Hence, each organism possesses a unique consciousness, defined by its particular form and its specific access to the ideological matrix, shaping its unique reality or *Umwelt*.

7.3 Consciousness as *Umwelt*

This theory embraces Jakob von Uexküll's concept of *Umwelt*—the subjective world that an organism inhabits (76, 82, 104). Here, *Umwelt is identified directly with consciousness: it is the field of experience shaped by the access to forms within the ideological matrix*. Consciousness is not just an internal state but the very world the organism perceives and interacts with. This holistic understanding situates consciousness as the lived reality arising from the interface of virtual forms and their actualization.

Importantly, this framework goes far beyond a phenomenological account in which each living being merely perceives the world differently, reducing the problem of knowledge to one of perception and thereby deepening the subject–object divide. Instead, it articulates an ontologically grounded worldview: the world-as-a-whole is projected through consciousness as the unfolding manifestation of virtual forms into actuality.

7.4 Relationship to Classical Concepts

The theory's notion of consciousness resonates with classical ideas such as Aristotle's *psyche*—the principle of life and form—and Driesch's *entelechy*—the intensive force directing development outside space and time. However, it surpasses traditional dualisms by rejecting the strict separation between form and matter, and subject and object, proposing instead a non-dualistic continuity in which consciousness is the lens

through which the unfolding of the living world itself occurs. In this sense, the living world is nothing other than the projection of the ideological matrix into actuality, a reflection of its virtual forms as mediated through consciousness.

7.5 Universal Consciousness and Hierarchical Access

The ideological matrix, as a continuous and layered structure of all idea-forms, implies a universal consciousness encompassing all individual consciousnesses. This universal consciousness coincides with the highest-order teleological-purposeful agent that self-recognizes and initiates the entire evolutionary unfolding process.

Importantly, this universal consciousness differs from individual consciousnesses only in degree, not in nature. Both are subject to the same ontological norms, but the universal consciousness has access to the deepest and most comprehensive layers of the ideological matrix, directing the grand unfolding of life's complexity.

7.6 Consciousness and Teleological-Purposeful Formal Agents

Within the Evolutio Unfolding Theory, consciousness and teleological-purposeful formal agency are one and the same. The act of seeing a potential form within the ideological matrix is simultaneously the act of projecting it into realization. Perception and actualization are inseparable: *to see is to do*. Every act of consciousness unfolds virtual potentials into actualized forms, rendering the process of development and evolution both directed and purposive.

This framework dissolves the apparent duality between observation and action: the form determines both what can be accessed and what comes into existence, and the process of apprehension is itself the process of realization. Consciousness is therefore not a passive witness but the *active formal agent* — the intrinsic, teleological force that brings nested potentials into the living world.

Seen in this light, the "telescopic sight" emphasizes the capacity of consciousness to access multiple nested layers of potential forms. Yet this is not separate from action; it is the act of projection itself, the doing that actualizes what is apprehended. In short, *consciousness is the teleological-purposeful formal agent enacting the evolutionary and developmental trajectory of life*.

7.7 Biological Illustration

Consider the development of a frog or urodele embryo. Each stage of embryogenesis—from the initial cleavage of the zygote, to gastrulation, neurulation, and organogenesis—represents a sequential actualization of nested potentials contained within the embryo's life-trajectory in the ideological matrix.

• During **gastrulation**, cells move and rearrange to form the three germ layers. This morphogenetic movement can be seen as a projection of virtual form: the potential organization of tissues is "seen" by the agentic consciousness of the system and simultaneously actualized.

• During **neurulation**, the neural plate folds into the neural tube. The shape transformations and tissue-specific differentiations are not random but follow a nested developmental plan encoded as virtual potential forms. The embryo "knows" these forms, and through the unfolding of the morphogenetic fields, the forms emerge in the correct spatial and temporal order.

• **Organogenesis** further illustrates this principle: limb buds form, tissues differentiate, and complex organ structures arise, each as a successive unfolding of potentials. The morphogenetic changes, structural transformations, and precise spatial patterns reflect the teleological guidance embedded in the system, with consciousness-as-agent projecting potentials into actual morphology.

From this perspective, the developing embryo is a dynamic enactment of its own life-history. Each morphogenetic event is both a perception and a projection — a stage in the progressive actualization of complex forms contained within the ideological matrix. Consciousness and teleological-purposeful agency are inseparable in orchestrating this ordered, purposive morphogenesis.

8 Critique of Prevailing Evolutionary Paradigms

8.1 Introduction

The Evolutio Unfolding Theory offers a novel framework for understanding biological evolution, emphasizing purposive formal causality, teleological agents, and the unfolding of nested potentialities. To appreciate its distinctive contributions, it is necessary to situate the theory within the broader landscape of evolutionary thought.

This section provides a systematic critical contrast between the Evolutio Unfolding Theory and both classical and contemporary evolutionary paradigms. It highlights conceptual, methodological, and ontological assumptions that underpin these frameworks, elucidating the ways in which they succeed, fall short, or diverge from the unfolding perspective.

For clarity, the discussion is organized into two main subsections: (1) **Classical Theories**, including Materialism, Mechanicism, Darwinism, Lamarckism, Adaptationism, Organicism, and Vitalism; and (2) **Contemporary Frameworks**, covering Stuart Kauffman's complex systems and emergence, Rupert Sheldrake's morphic resonance, Denis Noble's systems biology, and broader emergentist approaches. This organization enables a coherent evaluation of the evolution of theoretical perspectives while situating the Evolutio Unfolding Theory as a rigorous, testable, and ontologically grounded alternative.

8.2 Materialism: Reductionism and Its Limits

Materialism, foundational to much of modern biology, posits that all biological phenomena can ultimately be explained in terms of physical matter and its interactions (18, 63, 87). Life, under this framework, is conceived as the product of material processes—molecular interactions, chemical reactions, and biophysical dynamics—without recourse to non-

material causes, purpose, or formal principles. As Mayr observed, the materialist tradition shaped evolutionary thought by insisting on purely physical and causal explanations, banishing teleology from scientific discourse (60).

While materialism provides a coherent framework for studying proximate causes and physical processes, it encounters intrinsic limitations in explaining the organized, purposive patterns of development and evolution. The principle of evolutionary order—that higher complexity cannot arise from interactions of simpler elements—cannot be fully captured within a purely materialist paradigm, since materialism treats complex structures as emergent from lower-level physical interactions without accounting for formal causation or intrinsic purposiveness (25, 92).

This limitation becomes especially evident when considering morphogenetic fields, which exhibit nested and hierarchical organization that cannot be exhaustively reduced to biochemical interactions (18, 51). By itself, materialism leaves unexplained the coordination and directionality of developmental processes. Mechanicism, discussed next, attempts to extend materialist reasoning by analyzing parts and interactions, but it inherits similar limitations when addressing higher-order biological organization.

8.3 Mechanicism: Limits in Explaining Higher-Order Complexity

Mechanicism, as articulated in the philosophy of biology, emphasizes decomposing biological systems into parts and activities to explain phenomena through their interactions (6–9, 29, 30). This approach excels in describing local interactions—such as cellular pathways, metabolic networks, or neural circuits—where causal chains can be reconstructed in detail. Mechanistic models have thus proven indispensable for molecular biology and neuroscience.

However, as Bechtel himself acknowledges, the mechanistic framework faces significant limitations when addressing the formation of higher-level structures, such as tissues, organs, or entire organisms (7). While decomposition reveals how components interact, it does not provide an ontologically grounded explanation for why complex, integrated structures arise in an organized, purposive manner. Craver notes that mechanistic explanation is inherently mosaic and often requires "patchwork" integration, leaving unresolved how wholes achieve unity beyond the sum of their parts (29).

The explanatory gap arises because mechanistic accounts lack formal causality and teleology: mechanisms can specify local causal chains but cannot justify the purposive emergence of functional wholes. In higher-order biological complexity, mechanistic models often invoke emergentist terminology or phenomenological "black boxes" to bridge the gap, implicitly acknowledging the insufficiency of part-whole analysis alone (8, 9, 25, 30, 92).

By contrast, the Evolutio Unfolding Theory situates complexity within nested morphogenetic fields guided by teleological agents, allowing for the structured, purposive actualization of higher-order forms that mechanistic approaches alone cannot explain (83).

8.4 Darwinism, Neo-Darwinism and the Extended Evolutionary Synthesis: Incomplete Explanations of Evolution

8.4.1 Darwinism

Darwinism, grounded in *On the origin of species* (1859), introduced natural selection as the principal driver of adaptation and the diversity of life (32). It successfully explained phenomena such as adaptation, speciation, and population dynamics, yet it left unanswered a deeper question: the origin of biological form itself. Darwin's framework emphasized competition and survival but remained largely silent on the generative principles underlying complex, integrated structures and the teleological dimension embedded in developmental and evolutionary processes (63, 92).

The Evolutio Unfolding Theory (EUT) addresses this gap by positing that forms are preformed within a virtual ideological matrix and are actualized sequentially through unfolding, guided by teleological-purposeful formal agents (83). This teleological perspective challenges the Darwinian emphasis on randomness and competition, suggesting instead that evolution is a purposeful process of self-actualization governed by formal causality and universal organizing principles. In fact, the EUT establishes that nothing purposeful and meaningful can be created out of random and aleatory events.

8.4.2 The Modern Evolutionary Synthesis (MES)

The Modern Evolutionary Synthesis (MES), also known as Neo-Darwinism, sought to refine Darwin's theory by anchoring variation and inheritance in genetic mechanisms. Its gene-centric view reduces development and evolutionary novelty to genetic mutation and recombination (31, 60). While powerful in explaining heritable variation and adaptation, it encounters persistent limitations:

1. Causality Limitations: The Modern Evolutionary Synthesis explains patterns of change but does not account for the emergence of complex integrated forms. Genetic information alone is insufficient to specify higher-order structure or organizational principles (51, 103).

2. Reductionist Bias: MES often treats organisms as passive vehicles for genes, overlooking the active role of cells, tissues, and organisms in shaping developmental outcomes (70).

3. Teleology and Purpose: The MES framework denies intrinsic purposiveness, rendering questions of functional integration and goal-directed development as epiphenomenal or metaphorical (63, 92).

This *causal deficiency* of Darwinism in general is a symptom of a deeper and more serious problem. The principle of natural selection is ultimately an *a posteri* process: "*the preservation of favoured races in the struggle for life*" is rather the *effect* than the cause of it. Thus, the principle of natural selection often presents its effect—the preservation of favored traits—as its cause, implying a form of *retrograde causality* (83).

8.4.3 The Extended Evolutionary Synthesis (EES)

In response to such limitations, the Extended Evolutionary Synthesis (EES) was proposed to expand the explanatory scope

of MES. Proponents of the EES have sought to incorporate additional mechanisms beyond classical natural selection, including phenotypic plasticity, niche construction, developmental bias, and epigenetic inheritance (55, 88). While the EES represents a significant conceptual expansion, it remains fundamentally constrained in several ways:

• **Mechanistic Vagueness:** Though acknowledging multiple causal influences, the EES lacks a formal, ontologically grounded mechanism for how novel higher-order structures that are both meaningful and purposeful originate.

• **Structural Influences:** Some EES authors describe phenomena such as "constructive processes" or "developmental bias" (55). These processes are not teleological: they do not involve intrinsic goals or purposive agents. Rather, they are structural in nature, shaping the space of possible developmental outcomes—essentially defining *a morphospace of feasible forms*. In this sense, *they demarcate or delimit the range of possibilities*, creating tendencies or biases in the direction of variation, but *they do not "aim" at any specific outcome*. While these structural factors can influence which forms are more likely to appear, that is, they can establish tendencies, they cannot account for the purposive and hierarchical actualization of forms, which is central to the Evolutio Unfolding Theory.

• **Novelty Generation:** The EES improves over MES by recognizing non-genetic contributions to evolution but still often relies on emergentist or statistical explanations for the origin of complexity, rather than specifying clear formal-structural causes for the appearance and generation of higher-level complexity (54, 88).

The Evolutio Unfolding Theory transcends these limitations by situating novelty and complexity within a structured matrix of potentialities encoded in morphogenetic fields. Teleological agents actualize these potentials, generating forms with hierarchical organization, purposive integration, and developmental directionality that remain unexplained under MES or EES frameworks (83).

8.4.4 Summary

In sum, while the MES laid the foundation for understanding evolution via genetic variation and natural selection, and the EES expands this understanding to include developmental and ecological mechanisms, both frameworks fall short of a formal, teleologically coherent, and ontologically grounded explanation of the origin and structured unfolding of biological complexity.

8.5 Lamarckism and Neo-Lamarckism: Revisiting Purpose and Inheritance

8.5.1 Lamarckism

Jean-Baptiste Lamarck (1744–1829) was among the first to propose a systematic theory of evolution in 1809, decades before Darwin. His central idea was that organisms could pass on traits acquired during their lifetime to their offspring — for example, the stretching of the giraffe's neck to reach leaves (56). He emphasized *the role of use and disuse and the inheritance of acquired characteristics as the motor of evolutionary change*. Although later discredited by August Weismann's germ-plasm theory, which claimed that acquired changes in somatic cells could not affect germ cells (106), Lamarck's insistence on the plasticity of life and its responsiveness to environment kept his ideas influential throughout the 19th century.

8.5.2 Neo-Lamarckism

During the late 19th and early 20th centuries, various thinkers revived and reformulated Lamarckian principles under the umbrella of Neo-Lamarckism. Figures such as Edward Drinker Cope (26, 27) in the United States, Samuel Butler (20, 21) and Herbert Spencer (100, 101) in England, Yves Delage in France, and several Russian embryologists argued that environment-induced modifications and functional adaptations could influence heredity and development (16, 19).

While their perspectives differed, a common thread was their critique of Darwin's principle of natural selection as the primary evolutionary cause. Butler rejected selection almost entirely, emphasizing learning and memory-like processes; Spencer integrated inheritance of acquired characters into his broader theory of progressive evolution; Cope developed his own causal principles such as *kinetogenesis* and *bathmism*.

Despite these innovative attempts to link activity, learning, memory and heredity, Neo-Lamarckian models largely remained mechanistic and emergentist (*de novo* generation) in their explanatory structure. They lacked a deeper ontological account of form, purpose, or formal causality, leaving unresolved the problem of how purposive organization arises in evolution.

8.5.3 Modern Echoes: Epigenetics and Developmental Plasticity

In recent decades, advances in epigenetics and developmental biology have renewed interest in Lamarckian-style inheritance. Epigenetic modifications such as DNA methylation, histone modification, and non-coding RNAs can transmit acquired states across generations, suggesting that life experiences and environmental stresses may leave heritable imprints (45, 98). Similarly, concepts like developmental plasticity and niche construction theory emphasize the active role of organisms in shaping their evolutionary trajectories (75, 107). These frameworks have been described as "neo-Lamarckian" insofar as they reintroduce the inheritance of acquired characteristics, albeit through molecular and ecological mechanisms rather than direct transmission of somatic change.

8.5.4 From Behavioral Adaptationism to Teleological Formal Causation: The Evolutio Unfolding Theory

Despite their significance, these modern Lamarckian revivals still operate within a mechanistic framework. They describe how organisms react, adapt, or transmit modifications, but they do not address the purposive dimension of life. However, there is a much more fundamental problem with any kind of Lamarckism. This logical inconsistency implies considering the organoformative activity as an extension of the behavioral activity (94). Thus, for instance, Lamarckism would

imply that sugar-seeking behavior in the external environment could generate an internal organic system for sugar storage, or that foraging among tall trees could generate the organic system of a long neck. Such reasoning explains organs by behavior, but leaves unexplained the origin of the very behaviors it invokes. In any case, in any developing system, the behavioral activity is an extension and consequence of the organoformative activity. This logical inconsistency is common to any adaptationist conceptual framework. As we will see below, this framework reduces the evolutionary process to a mere adaptive process, thereby shifting the focus from the internal formative process itself to a process of external environmental adaptation.

The Evolutio Unfolding Theory extends beyond these limits by positing purposeful formal agents at the core of evolutionary dynamics. Evolution is not merely reactive to environment or chance molecular events, but *proactive and purposive*, with forms enfolded within a virtual ideological matrix that guides both development and evolutionary change. In this view, Lamarck's intuition that organisms actively participate in shaping their evolution is recovered — but reinterpreted through a framework of teleology and formal causation that places consciousness and purpose at the heart of life's unfolding.

8.6 Adaptationism: The Mirage of Fitting to an Environment

Adaptationism is one of the oldest explanatory frameworks in biology. Since Lamarck, and even earlier in Aristotelian thought, biological change has often been conceived in terms of organisms adjusting to circumstances. In this view, traits exist because they help the organism "fit" into an environment. Lamarck expressed this through the inheritance of acquired adaptations, while Darwin reformulated it in terms of natural selection, the "survival of the fittest", proposing that adaptive variants are preserved by external pressures.

8.6.1 Adaptationism in the Modern Synthesis

The rediscovery of Mendel's work in the early 20th century introduced genetics into evolutionary theory. The Modern Synthesis unified Mendelian genetics with Darwinian natural selection (36, 38, 44, 59). Within this framework, adaptationism became central: traits and genes were explained primarily in terms of their adaptive value, reinforcing the assumption that every biological feature must serve as a solution to environmental challenges, a view consolidated by Williams (109) and further expanded in Dawkins' gene-centered perspective (35).

8.6.2 Critiques from within Evolutionary Biology

Even within mainstream evolutionary biology, adaptationism has been strongly criticized. Gould and Lewontin argued that adaptationists tend to construct "just-so stories" for every trait, neglecting structural constraints and historical contingencies (42). Neutral theory showed that much genetic change is not adaptive at all (53). Evo-devo has further highlighted intrinsic developmental biases structural determinants that cannot be reduced to environmental fitting (66, 78). Earlier, D'Arcy Thompson had already argued in *On growth and form* that mathematical and physical laws strongly constrain biological form, offering a structuralist alternative to the adaptationist paradigm (102). Later, Brian Goodwin revived this perspective by proposing that morphogenetic rules and self-organizing principles are fundamental to the generation of biological form, independent of selective optimization (40).

8.6.3 Beyond Adaptationism: The Evolutio Unfolding Theory

From the perspective of the Evolutio Unfolding Theory, adaptationism is not merely limited — it is conceptually incoherent. Its central presupposition is that there exists an external "environment" to which organisms must adapt. Yet, in reality, the organism is born already with its *Umwelt*, intrinsically correlated to its form (76, 82, 104). Both organism and its *Umwelt* are co-given, prefigured in the ideological matrix before their actualization. The *Umwelt* is the field in which the organism is embedded (83).

Thus, what adaptationism describes as "adjustment to the environment" is in fact the unfolding of intrinsic forms embedded in morphogenetic fields. The environment, properly speaking, does not exist as an external entity: it is the sequential actualization of potential forms contained in the ideological matrix. Organism and world are not alien to one another, but expressions of the same morphogenetic field.

For this reason, adaptationism, like natural selection itself, cannot serve as a foundation for evolutionary theory. Both rely on the false image of organisms struggling to fit into an external world. Evolution is not a chain of contingent adjustments but the purposive, teleological unfolding of pre-existent virtual forms within the ideological matrix.

8.7 Organicism: The Ambiguity of Organization and Teleology

8.7.1 Definition and Origins

Organicism arose in the early 20th century as an attempt to overcome the limitations of both mechanistic reductionism and metaphysical vitalism. Its clearest and most rigorous formulation was provided by Ludwig von Bertalanffy in *Modern theories of development: an introduction to theoretical biology* (13). For Bertalanffy, the distinctive feature of living beings is not a mysterious vital force, nor the mere sum of their physicochemical processes, but their *organization*. Without organization there is no life: "destruction of the organization means at the same time destruction of life" (13, p. 47). Life is not a substance but an arrangement of components, and vital properties are systemic properties that emerge from the specific articulation of parts (81).

8.7.2 Organization and Regulation

In Bertalanffy's framework, the essence of the living being lies not in its material composition—since dead and living organisms are materially indistinguishable—but in the dynamic *organization* of processes and the *regulation* of relations between parts. Each process or element in an organism only has

meaning within the totality to which it belongs. Hence, the organism is a unitary whole, not a mere aggregate of parts. This shift from part-centered analysis to relational integrity laid the foundations for *General Systems Theory* (14) and continues to inform holistic biology today.

8.7.3 The Ambiguity of Unity

Despite this contribution, Organicism holds an ambiguous position regarding the notion of unity. On the one hand, it affirms that the organism is a whole greater than the sum of its parts. On the other hand, it continues to treat the organism primarily as a set of parts arranged in a special way. In this sense, *the "unity" of the organism is not ontological but organizational*—a tension that prevents organicism from fully accounting for the organism as a truly irreducible whole (81).

8.7.4 The Ambiguity of Teleology

This ambiguity extends to the problem of teleology. Bertalanffy explicitly argued that the term *teleology* should be abandoned, replacing it with the *organismic viewpoint*. For him, biological processes are not purposive in the sense of striving toward ends, but they are organized "as if" directed toward the maintenance, production, or restoration of the whole (13, p. 8). In this way, finality is reduced to the preservation of systemic order, and purposive language is reinterpreted as a descriptive metaphor. As Bertalanffy himself acknowledged, this was essentially an inheritance of Kant's position: *teleology as a regulative principle of thought rather than a constitutive principle of reality* (46).

Yet, the contradiction remains. As Bertalanffy admitted, we cannot speak of organs without implying function: a giraffe has a long neck *for* reaching higher leaves. The very grammar of biology seems to demand teleological concepts, even as organicism tries to neutralize them. Thus, organicism simultaneously recognizes and denies teleology, oscillating between metaphor and explanation, description and causation, although ultimately recognizing the first one and denying the second one (81).

8.7.5 The Revival of Organicism: Continuity, not Transformation

Near the turn of the twenty-first century, there was renewed interest in organicism in developmental biology and philosophical discussion. Influential voices, such as Gilbert and Sarkar, called for an "organicism for the twenty-first century", emphasizing complexity, systems, and emergent relationality (39). These efforts sought to counterbalance the reductionism of molecular biology and gene-centric approaches by highlighting the systemic, relational, and integrative nature of living systems.

However, this revival does not introduce substantial theoretical innovation. It largely rearticulates earlier organicist ideas in updated language and scientific context, without resolving the core conceptual tensions identified in Bertalanffy's original formulation (81). Modern iterations continue to affirm wholeness, relationality, and systemic integrity, but *they largely avoid specifying concrete causal mechanisms or teleological principles grounded in formal causality*. In this sense, the so-called "New Organicism" is essentially "Old Organicism" in contemporary attire: a conceptual rebranding rather than a substantive theoretical transformation.

8.7.6 Evaluation

Organicism advanced biology by foregrounding organization, regulation, and systemic relations as fundamental to life. It helped establish theoretical biology as a discipline distinct from mere physico-chemical analysis. However, its limitations are clear:

- It remains trapped in the Kantian framework, treating *teleology as a mode of thought rather than a principle of being*.
- Its concept of unity is ambiguous: *organisms are wholes, yet still conceived as arrangements of parts*.
- *It reduces purposiveness to homeostatic maintenance*, falling short of explaining the generative and historical directionality of life.

In contrast, the Evolutio Unfolding Theory does not see teleology as an "as if" fiction, but as a real, constitutive principle. It goes beyond organization and regulation, grounding purposiveness in formal agents and morphogenetic fields that unfold from an ideological matrix. What organicism treated as metaphor or descriptive convenience, the Evolutio Unfolding Theory treats as ontological reality.

8.8 Vitalism: From Marginalization to Rehabilitation

Vitalism, long marginalized within the life sciences, is often caricatured as the doctrine that posits *an obscure vital force added on top of physico-chemical processes*. But this simplification obscures the true conceptual depth of the tradition. At its core, vitalism affirms the existence of an *ontologically real agent* within organisms that directs, orders, and coordinates development. Against both the Atomists' vision of life as the random collision of particles and modern molecular reductionism, vitalists argued that life cannot be understood without acknowledging formative principles that transcend mere mechanics.

8.8.1 Historical Background and Proposals

From its beginnings, vitalism offered sophisticated attempts to grasp this agentic dimension. Aristotle's *psyche* was conceived as the *form of the body*, an intrinsic principle of organization and teleology (4). Hans Driesch, drawing on embryological experiments, argued for an *entelechy* capable of regulating development and restoring wholeness after experimental division (37). These were not crude "mystical forces", but carefully elaborated conceptual frameworks addressing phenomena that mechanistic science struggled to explain. Henri Bergson articulated an *élan vital* to account for evolutionary novelty, emphasizing creativity and unpredictability (12).

Despite their differences, these vitalists shared a commitment: life is not merely matter in motion but directed form, guided by an active principle. Their problem, however, was often a *strong dualism between form and matter*: unable to

abandon materialist premises, they conceived the vital principle as something "extra" added to matter. This separation, while conceptually necessary for them, generated epistemological difficulties that ultimately undermined vitalism's scientific legitimacy.

8.8.2 Strengths and Contributions

Vitalism's enduring strength was its insistence on *agency in life processes*. By affirming that organisms are not passive aggregates of parts but self-directing wholes, vitalism preserved a crucial insight absent in reductionist biology. Moreover, Aristotle's *psyche* and Driesch's *entelechy* remain among the most sophisticated attempts to formulate *a theory of biological agency*—clear, rigorous, and novel additions to biological thought (77).

8.8.3 Criticisms and Decline

By the mid-twentieth century, vitalism was largely abandoned, not only because it supposedly lacked empirical testability, but also because it clashed with the dominant materialist ontology of science (60). Biochemistry and molecular biology increasingly provided mechanistic explanations of vital processes, leaving little room for appeals to "entelechy" or "élan vital". Furthermore, the dualism between matter and form—never satisfactorily resolved by the vitalists—contributed to the suspicion that vitalism was metaphysical speculation rather than scientific explanation (1, 23).

8.8.4 Vitalism, Organicism, and Emergentism

Some later developments in twentieth- and twenty-first-century biology—such as *organismic biology* (first proposed by Bertalanffy (13); later revived by Gilbert & Sarkar (39), Soto & Sonnenschein (99), Nicholson (69), among others), *systems theory* (14), *cybernetics* (5, 108), and *systems biology* (73)—can be seen as *reformulations of vitalist intuitions into non-agentic, systemic, relational, and organizational conceptual frameworks*. However, these efforts sought to avoid the "obscurity" of vitalism by discarding the notion of intrinsic agents.

This move led to the *ambiguities of organicism*, which emphasized wholeness and organization but lacked a clear account of causal direction. Similarly, *emergentist frameworks*—including those developed in the *cybernetic-inspired autonomous systems* tradition of Maturana and Varela (58), later expanded by Moreno, Mossio and colleagues (64, 65)—preserve the systemic and relational aspects of life, but explain complexification as the result of bottom-up recursive and feedback loops rather than the action of real agents.

These approaches, while valuable, are not properly vitalist: *they substitute emergent order for intrinsic agency*.

8.8.5 Towards a Rehabilitation: Evolutio Unfolding Theory

The Evolutio Unfolding Theory rehabilitates the central insight of vitalism—*life as agentic*—while discarding its dualistic baggage. By rejecting a crude materialism, it dissolves the matter-form dualism that haunted earlier formulations. In this framework, there is no inert "matter" awaiting animation by a mysterious force; instead, *everything is form*: formal agents unfolding within formal morphogenetic fields. What Aristotle and Driesch intuited as *psyche* or *entelechy* are here reconceptualized as scientifically tractable formal causes, embedded in fields that structure development and evolution.

In this way, the Evolutio Unfolding Theory not only acknowledges the partial truth of vitalism but also provides the tools to overcome its conceptual limits. Life is no longer explained through an external principle imposed upon matter but through *internal teleological agents* that are ontologically real, coherent with both empirical data and philosophical rigor.

8.9 Rupert Sheldrake and Morphic Resonance

8.9.1 Core concepts

Rupert Sheldrake's concept of *morphic resonance* proposes that natural systems inherit a collective memory through nonlocal connections between similar forms across time and space (95, 96). This idea suggests that once a pattern is established, it becomes easier for similar patterns to arise elsewhere, implying a form of resonance or influence beyond conventional genetic and mechanistic explanations. Central to Sheldrake's theory is the notion of *habit*: biological and behavioral forms become easier to replicate through the repeated influence of past similar forms, effectively constituting an epigenetic process of collective memory (96). This frames evolution as a kind of learning or accumulation of habits across generations, aligning conceptually with Lamarckian ideas (56), especially as understood by Samuel Butler, who compared inheritance to memory — the cumulative record of behaviors and activities acquired through learning (20, 22, 110).

8.9.2 Points of Convergence

Both the Evolutio Unfolding Theory and Sheldrake's hypothesis of morphic resonance share a critical stance toward strictly mechanistic and reductionist accounts of life. Each recognizes that biological form and development cannot be fully explained by material interactions alone and instead proposes the action of *fields* as central organizing principles. In both perspectives, these fields are conceived as non-material yet formative, guiding the emergence of order, pattern, and continuity across developmental and evolutionary processes.

This common ground situates the two theories within a broader intellectual tradition that seeks to reintroduce formative principles into biology, recovering dimensions often excluded from modern scientific discourse. While their specific mechanisms and conceptual frameworks differ, they converge in the conviction that life's evolution requires an account beyond material causality, one that acknowledges the formative influence of immaterial fields.

8.9.3 Points of Divergence

Despite this shared orientation, the theoretical underpinnings and explanatory commitments of the two approaches

diverge significantly. Sheldrake's morphic resonance emphasizes non-local resonance and morphogenetic fields as carriers of collective memory, though it remains unclear how such fields establish their specific action at a distance or how they localize their influence. In contrast, the Evolutio Unfolding Theory posits *formal agents contained within morphogenetic fields as purposive centers of activity*, providing a more structured account of how teleological dynamics unfold in development and evolution (83). It provides explicit mechanisms and pathways by which evolutionary and developmental processes actualize nested layers of biological complexity, emphasizing *purposive formal causation* alongside efficient causes.

Another distinction concerns the nature of purposiveness. While Sheldrake's framework can be understood as purposive in the Lamarckian or Butlerian sense of "behavioral finality"—where learned and acquired behaviors may be internalized, memorized and transmitted—the Evolutio Unfolding Theory articulates *purposiveness as an intrinsic, formal principle guiding evolutionary unfolding*, not merely as accumulated habit or memory. In this sense, the Evolutio Unfolding Theory attributes a stronger ontological status to *purposive agency* than Sheldrake's hypothesis.

More importantly, the Evolutio Unfolding Theory does not conceive evolution as a process of accumulating habits or environmentally acquired modifications. Instead, it proposes a *virtual preformation: a foundational ontological structure containing all potential forms and stages of life's development already enfolded within a morphogenetic field* (83). Evolution is thus an unfolding or actualization of these pre-existing possibilities, guided by teleological agents that realize potentials rather than generating novelty through habit formation or environmental imprinting.

8.9.4 Fundamental Differences

This difference marks a fundamental departure in how each theory understands causality and evolutionary change. Sheldrake's morphic resonance posits a dynamic, historically contingent feedback loop where past forms influence future forms via habit, implying that novelty arises through a cumulative, epigenetic-like process (95, 96). By contrast, the Evolutio Unfolding Theory situates *novelty as inherent within a structured matrix of potentialities*, purposively actualized independently of prior occurrence or learned behavior (83).

8.9.5 Assessment

Sheldrake's framework has struggled to gain acceptance within mainstream biology, which has often dismissed it as speculative due to its lack of mechanistic clarity or sufficient empirical validation. The Evolutio Unfolding Theory addresses this gap by articulating explicit formal agents and morphogenetic fields as causative entities, supported by empirical patterns identified through network theory (Section 6). It thereby establishes a coherent and testable ontology that transcends the metaphorical and speculative nature of morphic resonance.

By clarifying these distinctions, it becomes evident that while both theories challenge strictly mechanistic Darwinian paradigms, they diverge sharply in their foundational assumptions about the source and nature of evolutionary novelty — *habit* and epigenetic accumulation versus *virtual preformation* and purposive unfolding.

8.10 Denis Noble's Systems Biology and Teleology

Denis Noble's pioneering work in systems biology has profoundly reshaped our understanding of biological causation, challenging the gene-centric, reductionist views that have dominated much of modern biology (70, 73). His approach emphasizes the importance of interactions across multiple organizational levels—from genes and molecules to cells, tissues, and whole organisms—highlighting that biological functions and forms emerge from complex regulatory networks rather than being dictated solely by genetic sequences (71, 72).

A key aspect of Noble's perspective is his recognition that causation in biology is multi-directional and reciprocal: not only do genes influence cellular behavior, but cellular, tissue, and organismal contexts also feedback to regulate gene expression (70, 72). This systems-level causation rejects the simplistic, one-way flow of information implied by the "central dogma" and gene determinism, positioning the genome as one actor among many in a dynamic biological network (71).

8.10.1 Points of Convergence with the Evolutio Unfolding Theory

Noble's emphasis on systems biology resonates with the Evolutio Unfolding Theory in recognizing that life's processes cannot be reduced to gene-centric mechanistic explanations. Both frameworks advocate for integrative perspectives that incorporate multiple levels of organization and causal modalities. While Noble highlights systemic interactions across scales, the Evolutio Unfolding Theory situates these dynamics within a deeper ontological framework of morphogenetic fields and purposive formal agents. In this sense, both approaches challenge classical upward causality (central dogma) and reductionism, converging in their commitment to a more comprehensive and holistic understanding of biological complexity.

8.10.2 Key Distinctions: The Nature of Agency, Formal Causality, and Teleological Intentionality

Despite these points of contact, critical conceptual differences separate Noble's approach from the Evolutio Unfolding Theory. Noble's systems biology, while systemic and teleological in a functional sense, remains fundamentally materialist: it bases its explanations on genes, molecules and their interactions (73). Teleology in this framework is emergent—a property that arises from the organization of lower-level components but lacks ontological primacy or genuine agency (72). From this vantage, teleological behavior is an epiphenomenon, a higher-order pattern supervening on, but ultimately determined by, the material substrate.

This perspective violates a foundational principle of the Evolutio Unfolding Theory: *the simpler cannot originate the*

more complex. The reduction of purposive agency and teleology to the behavior of genes and molecules implies a reversal of causal priority, ascribing genuine goal-directedness to what are fundamentally inert physical components. Such reductionism parallels widely critiqued explanations of consciousness as mere neuronal interaction, which similarly fail to account for the origin of subjective intentionality (24, 68).

By contrast, the Evolutio Unfolding Theory posits teleological formal agents as ontologically prior, irreducible drivers embedded within morphogenetic fields that actualize pre-existing potentialities. This reframes biological teleology as a fundamental causal principle rather than an emergent property, thereby offering a coherent explanatory framework for purposiveness, agency and complexity that systems biology alone cannot provide.

8.11 Stuart Kauffman and Emergence

Stuart Kauffman is a foundational figure in complex systems biology, known for his pioneering work on *self-organization* and the concept of *emergence* in evolutionary and developmental processes (47, 48). His framework emphasizes how order and novelty can *spontaneously* arise from the nonlinear interactions of many components within biological systems, without the need for external direction or pre-existing templates. Kauffman's vision places *self-organization* alongside *natural selection* as a central mechanism generating complexity, proposing that life continually navigates a "fitness landscape" shaped by collective dynamics and constraints (49).

8.11.1 Emergence and Self-Organization as a Source of Novelty

Kauffman's core idea is that as biological systems—say gene regulatory networks or metabolic pathways—increase in complexity and connectivity, they approach critical thresholds where spontaneous order or new stable patterns emerge. These "phase transitions" are nonlinear shifts where the system reorganizes itself into novel configurations without requiring external guidance or teleology (47).

He views these emergent patterns as "self-organized attractors" in the state space of the system, meaning new biological forms and functions appear as inherent possibilities arising from the system's internal dynamics. This unpredictability and novelty are not random but constrained by the structure and interactions of the components (48).

Kauffman's emergentist explanation posits that biological complexity increases by crossing such thresholds of self-organization, producing new levels of order and function that were not explicitly programmed or designed but emerge from the system's inherent properties.

8.11.2 Critique of Self-Organization in Kauffman's Emergence Framework

Kauffman's emergentist approach frames biological complexity as arising from self-organization: as components like gene regulatory networks or metabolic pathways increase in connectivity and complexity, they reach critical thresholds where new stable patterns or "phase transitions" spontaneously emerge. These novel organizational patterns, or "self-organized attractors", appear as inherent possibilities within the system's internal dynamics—without external guidance or teleology.

However, this account leaves open the critical question: where do these new stable patterns and meaningful functional configurations actually come from? How do higher-order structures with specific meaning and purpose emerge purely from the interactions of lower-order components?

In essence, this is the classic problem of explaining complexity and purposiveness as mere products of *chance* and *undirected dynamics*. However sophisticated the vocabulary of "emergence", "complexity" or "attractor states", it risks becoming a veil that obscures the fact that what is ultimately posited is *randomness* and *fortuity*—thinly disguised by mathematical elegance, nonlinear dynamics, and attractor-state descriptions. The constraints in Kauffman's systems do not themselves introduce purposive direction; they merely *delimit the arena within which blind processes operate*.

This critique echoes Cicero's enduring skepticism: how can fortuitous collisions of inert particles give rise to the exquisite order and meaningful organization we observe in living systems—much less the richly integrated teleological structures described by the Evolutio Unfolding Theory? To believe in such a *spontaneous* and *blind* creative process is akin to accepting that a random shuffling of letters could produce a coherent literary masterpiece like the *Annals of Ennius*.

The fundamental fallacy here is a *reductionist inversion of causality*, trying to *explain the origin of higher-order, purposive structures entirely in terms of lower-order components and their interactions*. This violates the principle that *the simpler cannot originate the more complex*—a foundational pillar of the Evolutio Unfolding Theory.

By contrast, the Evolutio Unfolding Theory posits that biological novelty and complexity emerge not from randomness or blind self-organization but from the *purposive actualization of virtual preformations within morphogenetic fields*. These fields contain *nested, teleological potentialities that are unfolded by formal agents—irreducible causal entities that provide the foundational teleological agency necessary for genuine evolutionary creativity and meaningful biological organization*.

8.12 Emergentism and Its Derivatives: A Critical Analysis

8.12.1 Introduction: Defining Emergentism

Emergentism, as a philosophical and scientific doctrine, asserts that complex systems can give rise to novel properties or causal powers—"emergent properties"—which are not reducible to or predictable from their constituent parts (17, 52). This idea has gained considerable traction as an alternative to strict reductionism and mechanistic materialism, particularly in the life sciences, cognitive science and systems biology. It promises to account for phenomena such as consciousness, life and biological organization by positing ontological novelty arising at higher levels of complexity (2, 97).

Emergentism's appeal rests on its capacity to explain how new qualities or forms of organization can "appear" in systems

composed of simpler elements, without invoking external designers or metaphysical dualism. Yet, despite its broad acceptance, emergentism remains conceptually vague and scientifically underdetermined, especially regarding the mechanisms that produce emergent novelty and purposiveness.

8.12.2 Core Tenets and Mechanisms in Emergentism

At its core, emergentism maintains that higher-level properties are ontologically novel but depend on lower-level physical substrates. These emergent properties are often described as "irreducible", meaning they cannot be fully explained by or reduced to micro-level processes, yet they "supervene" on them, such that any change at the emergent level requires a change at the lower level (74).

Mechanistically, emergentists frequently invoke *complex interactions*, *nonlinear dynamics*, and *self-organization* as the sources of novelty. In biological systems, this translates into frameworks where gene regulatory networks, metabolic pathways, or neural assemblies reach critical thresholds—"phase transitions"—that yield novel, stable organizational patterns (43, 47). These novel patterns or "attractors" in state space are said to instantiate emergent biological functions and forms without explicit external control or prior design (90).

The language of "emergence" thus often functions as a conceptual placeholder for the appearance of novelty that is neither fully random nor strictly predetermined, but "spontaneous" and "system-inherent". Yet, as several critics have noted, this explanatory move remains incomplete without a precise account of *how* and *why* such novelty arises and what it fundamentally consists of (25, 52).

8.12.3 Philosophical and Scientific Pitfalls of Emergentism

Despite its widespread use, emergentism suffers from multiple, interconnected weaknesses:

Conceptual Vagueness

The notion of emergence often lacks rigorous definition, allowing it to function as a catch-all term that obscures rather than clarifies causal explanations. This conceptual looseness permits multiple, sometimes incompatible interpretations, ranging from weak (epistemic) emergence (10) to strong (ontological) emergence (74). Even leading proponents acknowledge this difficulty: O'Connor observes that emergentist strategies have been regarded with suspicion because formulations of "emergence" have often been imprecise and not obviously reconcilable with one another (86). While later defenses attempt to provide greater coherence (74), critics argue that the term too often functions as a placeholder rather than a precise explanatory principle, leaving unsettled the ontological and causal status of emergent properties. Without a clear causal account, emergent properties risk collapsing into epiphenomenalism (see below).

Epiphenomenalism and Causal Inefficacy

A central challenge for emergentism lies in what Jaegwon Kim has termed the *causal exclusion problem* (52). The worry is this: if every physical event already has a sufficient physical cause at the lower level, then there seems to be no causal work left for higher-level emergent properties to perform. Any attempt to ascribe causal efficacy to emergent properties risks redundancy, making them appear as *epiphenomena*—mere byproducts or shadows of underlying physical processes, rather than genuine contributors to causal chains. In this view, emergent properties collapse into being at best useful descriptors, *not active explanatory agents in biological or cognitive processes*.

Reductionist Inversion of Causality

Emergentism often attempts to explain the origin of complex, purposive structures solely through lower-level interactions. This violates a foundational principle articulated in the Evolutio Unfolding Theory: *the simpler cannot originate the more complex*. The implicit assumption that complex purposiveness spontaneously "emerges" from undirected interactions reflects an *inversion of causal priority* (83).

As-If Teleology and Emergentist Reduction

The appeal to teleology within emergentist and organicist traditions often rests on a regulative, "as-if" principle rather than a recognition of genuine teleological causation. This conceptual lineage can be traced back to Kant's view of teleology as a heuristic for understanding organisms, taken up by Bertalanffy in his organicism, where purpose is reduced to "self-maintenance" and "self-preservation". Such "as-if teleology" was later codified in the notion of *teleonomy* (89) and more recently revived in works such as *Evolution "on purpose"* (28). While these frameworks acknowledge the appearance of purposiveness, they consistently fall short of *grounding it in real formal causes*.

This reductionist tendency extends into autopoietic and enactivist traditions (58, 64), where the organism's organization is described as inherently "self-maintaining" but not genuinely teleological. In contemporary enactivism, the gap is bridged through the phenomenological concept of *intentionality* (62), as in the work of Evan Thompson (103). Here, intentionality "emerges" from systemic organization, but again functions only as a *proxy for purposefulness*, not as an account of teleological causality. The result is a recurring pattern: *teleology is simulated, redescribed, or symbolically substituted, but never ontologically established*.

Lack of Testability and Mechanistic Clarity

Emergentism's reliance on metaphorical language—"self-organization", "attractor states", "phase transitions"—often evades rigorous empirical testing. This hampers its capacity to generate falsifiable hypotheses or explicit causal mechanisms, thus limiting its scientific explanatory power (25).

Dependence on Chance and Statistical Inevitability

Underneath the emergentist vocabulary often lies an implicit appeal to chance and randomness, masked by mathematical elegance. Novelty is explained as statistically likely outcomes of complex interactions, without addressing the source or ontological status of teleological agency (18).

8.12.4 Historical Aside: Metaphorical Drift in Core Scientific Theories

The risks of metaphorical slippage are not confined to emergentist discourse. A notable historical example is Darwin's concept of *natural selection*. From its inception, critics pointed out that "selection" implies an active selector—an intentional agent—thus personifying nature. Darwin defended against these accusations alleging that it was just a *"metaphorical expression"*, a shorthand for the preservation of favorable variations (33, p. 85). However, his own descriptions sometimes reinforced the problematic connotations, as when he compared the process to "a force like a hundred thousand wedges" thrusting out weaker forms (34, p. 163). While this analogy captures filtering effects, a filter cannot truly "select"; only its maker can. The metaphor thus smuggled in attributes incompatible with Darwin's mechanistic intent. Therefore, the problem is not the use of a particular term or metaphor, but the attribution of characteristics and properties that are not contained in that term or metaphor (80). This illustrates how a scientific concept can inherit logical inconsistencies from its metaphorical origins—a dynamic that, as we shall see, also fuels distortions in contemporary appropriations of emergentism.

8.12.5 Emergentism in Contemporary Discourse: Derivatives and Intellectual Appropriations

The conceptual flexibility and vagueness of emergentism make it fertile ground for derivative interpretations, particularly in non-academic knowledge networks and spiritual circles. In some of these frameworks, the notion of "unfolding" — central to the Evolutio Unfolding Theory — has been incorporated without proper acknowledgment of its original theoretical source. This lack of intellectual recognition, through omission of citation or concealment of authorship, both obscures the lineage of ideas and erases the conceptual foundations that sustain them.

Two principal patterns of conceptual appropriation can be distinguished:

1. Terminological Appropriation: The direct transplantation of a term or label into another framework, without the supporting theoretical architecture or causal principles. While the term is preserved, its original content and explanatory power are lost or misrepresented. In this case, the original source is effectively erased, and the concept is presented as if it naturally arises within the new framework.

2. Conceptual Architecture Appropriation: The adoption of the underlying structure, logic or explanatory framework of a theory, but with the original terminology replaced or obscured. Here, the content is preserved, but the original labeling is disguised, giving the impression of a novel theory while concealing the conceptual origin. This too results in the erasure of intellectual attribution.

These two patterns, whether through terminology or architecture, illustrate how derivative uses of scientific concepts can detach key ideas from their rigorous conceptual foundations, leaving them susceptible to metaphorical, vague, or non-teleological reinterpretations. In the case of emergentism, such appropriations amplify the already present conceptual ambiguities, further muddling the distinction between metaphor and mechanism.

8.12.6 The Evolutio Unfolding Theory as a Formal, Testable Alternative

The Evolutio Unfolding Theory addresses the deficiencies of emergentism by positing teleological formal agents embedded within morphogenetic fields as irreducible causal entities. These agents actualize virtual preformations—nested potentialities ontologically prior to their actual manifestation—thereby providing a structured and purposive mechanism for the origin of biological novelty and complexity (83).

This framework upholds the *Principle of Preformative Causation*, asserting that higher levels of complexity cannot originate solely from the interactions of lower levels. In doing so, it avoids the *reductionist inversion of causality* endemic to emergentism, and moves beyond metaphor by specifying explicit mechanisms and generating testable predictions.

The Evolutio Unfolding Theory also avoids the "causal exclusion problem" by rejecting the layered model that sets physical causes and emergent properties into competition. Rather than treating emergent features as higher-level add-ons duplicating physical causes, EUT locates causality in formal agents within morphogenetic fields, which function as the intrinsic teleological structures guiding development and evolution. These agents are not additional or competing causes, but the very organizational principles by which physical dynamics unfold. In this way, the theory sidesteps the causal exclusion trap: higher-order properties are not superfluous add-ons but constitutive of the causal process itself. They do not merely describe outcomes of physical causation but direct the unfolding of form and function from within.

While emergentism acknowledges the undeniable novelty and intricacy of life, it remains conceptually and scientifically incomplete. The Evolutio Unfolding Theory offers a rigorous, ontologically grounded, and empirically viable framework that integrates biological teleology, agency and scientific method—providing a coherent explanation for the purposive structure of living systems.

9 The Ideological Roots and Limitations of Darwinism

While Darwin's theory of natural selection is often portrayed as a purely scientific breakthrough grounded in empirical observation and mechanistic causality, a deeper historical and conceptual analysis reveals its profound ideological underpinnings. This critique does not aim to diminish Darwin's contributions but rather to uncover how the theory emerged and solidified within a socio-political context shaped by liberal economic thought and Malthusian principles.

9.1 Historical Background: From Blyth to Darwin

Natural selection was not originally conceived as a creative, generative force. Edward Blyth, a contemporary of Darwin,

articulated natural selection as a conservative mechanism that preserves species' typical forms by filtering out less adapted variants (15). Blyth's understanding, grounded in the Malthusian language of "struggle for existence", framed natural selection primarily as a stabilizing filter rather than a source of novel biological innovation.

Darwin's work, while expanding the concept to include a creative role for natural selection, remained conceptually ambiguous. Throughout *On the Origin of Species*, he oscillated between emphasizing preservation and modification. Crucially, Darwin recognized that natural selection acts only on variations that already exist—it cannot originate novelty itself. This reveals the intrinsic limitation of the natural selection framework as an explanatory mechanism for the emergence of biological complexity.

9.2 The Metaphor and Ideological Personification of Nature

Darwin employed metaphorical language, personifying Nature as a selector or judge. While he defended this as a linguistic convenience, the metaphor carries ideological weight by attributing purposive agency to an impersonal aggregate of natural laws. This personification masks the underlying assumptions embedded within the concept of natural selection and subtly legitimizes value judgments about fitness, survival and adaptation.

9.3 Malthusian Influence and the Naturalization of Social Values

Darwin's theory is deeply infused with the influence of Thomas Malthus' *Essay on the principle of population* (57), which articulated a harsh vision of population growth constrained by limited resources, inevitably leading to competition and survival of the "fittest". This framework naturalizes socio-economic inequalities by framing them as unavoidable and just consequences of natural laws.

Darwin explicitly endorsed these value judgments, asserting that natural selection "acts solely by and for the good of each", ensuring that no detrimental traits survive. This view reflects a broader ideological inheritance from liberal economic thought, where competition, property rights and social hierarchy are regarded as natural and necessary. Thus, the theory of natural selection serves not only as a biological explanation but also as a legitimizing narrative for prevailing social orders.

9.4 Implications for Contemporary Evolutionary Biology

The ideological foundations shaping Darwinism have contributed to an evolutionary biology dominated by mechanistic, reductionist models emphasizing random variation and selection. These models often overlook or dismiss teleological, purposive and consciousness-related dimensions of life processes.

Recognizing these embedded biases is critical to transcending the limitations of the current paradigm. The Evolutio Unfolding Theory challenges these assumptions by proposing evolution as a purposeful unfolding driven by teleological formal agents within morphogenetic fields, incorporating consciousness as a fundamental organizing principle.

10 Consequences and Future Directions

The Evolutio Unfolding Theory is not merely a philosophical or conceptual framework — it is already supported by empirical evidence. As demonstrated in Section 6, network-based empirical analyses of developmental and evolutionary processes reveal the patterned, modular and hierarchical structures predicted by the theory, aligning with the view of evolution as a purposeful unfolding guided by formal teleological agents within morphogenetic fields. These findings move the theory beyond speculation, providing an initial experimental foundation.

With this groundwork established, the focus now shifts toward expanding and diversifying empirical inquiry, refining theoretical synthesis, and exploring the broader societal and philosophical implications of adopting an unfolding paradigm.

10.1 Theoretical Implications

The Evolutio Unfolding Theory reintroduces formal causation and teleology into the heart of evolutionary biology, challenging the reductionist, mechanistic orthodoxy inherited from Darwinism and Neo-Darwinism. By grounding its claims in both empirical evidence and a coherent metaphysical framework, the theory opens new possibilities for an integrative science that bridges:

- **Biology and Philosophy of Science:** unifying descriptive, explanatory and normative dimensions of life studies.
- **Evo-Devo and Systems Theory:** linking modular development and network dynamics to large-scale evolutionary transformations.
- **Transdisciplinary Research:** fostering cross-pollination between biology, physics, complexity science and consciousness studies.

10.2 Future Empirical Directions

Building on the initial confirmation achieved through network-based empirical approaches, future research can:

1. **Map Morphogenetic Field Dynamics:** employ advanced imaging and modeling to directly detect and quantify field-like processes in development.
2. **Compare Evolutionary Network Architectures Across Taxa:** identify conserved modular patterns as signatures of universal unfolding motifs.
3. **Perturb Morphogenetic Constraints:** test predictions about resilience and transformation when specific structural conditions are altered.
4. **Probe Consciousness–Biology Links:** investigate correlations between morphogenetic unfolding and emergent cognitive or behavioral structures.

10.3 Broader Societal and Philosophical Ramifications

Accepting evolution as a purposeful unfolding rather than a random, purely selective process reshapes humanity's self-understanding:

• **Ethics and Environmental Stewardship:** situating humans as participants in, not masters of, life's unfolding process fosters a relational, responsibility-centered ethos.

• **Education and Scientific Culture:** encouraging frameworks that integrate teleology and systems thinking into curricula, counterbalancing reductionism.

• **Philosophy of Life:** inviting a worldview in which complexity, order and consciousness are not accidents, but intrinsic to the evolutionary process.

The Evolutio Unfolding Theory thus stands at a threshold: empirically anchored yet pointing toward vast unexplored territories. By continuing to bridge evidence and vision, it offers both a scientific program and a philosophical horizon — a path toward understanding life not as a blind outcome of chance and necessity, but as the progressive actualization of an ordered, meaning-bearing cosmos.

11 Conclusion

The Evolutio Unfolding Theory offers a transformative reimagining of evolutionary processes that transcends the mechanistic and reductionist confines of Darwinism and Neo-Darwinism. By embracing teleological formal agents and morphogenetic fields as central drivers of life's unfolding complexity, this framework restores a profound depth to our understanding of biological development and evolution — one that integrates purpose, agency and meaning within the very fabric of life.

Throughout this work, we have traced the historical and conceptual roots that shaped prevailing evolutionary paradigms, uncovering their embedded ideological assumptions and limitations. Against this backdrop, the unfolding theory emerges not as a mere alternative mechanism, but as a fundamental ontological shift that reconnects biology with philosophy, systems thinking and consciousness studies.

Importantly, this theory is not confined to abstract speculation. Empirical findings, particularly those employing network-based empirical approaches, provide substantive support and open promising avenues for further experimental validation. This interplay of rigorous empirical grounding and visionary conceptual synthesis situates the theory as both scientifically robust and philosophically fertile.

Looking forward, the Evolutio Unfolding Theory invites the scientific community and society at large to reconsider the nature of life — not as a competitive accident or random trial, but as an ongoing, purposeful unfolding of potentialities. This perspective calls for new research methodologies, interdisciplinary collaborations, and an ethical orientation that honors the intrinsic value and interconnectedness of all living beings.

In this light, the theory offers a hopeful and coherent vision: one where science and philosophy unite to illuminate life's mysteries and guide humanity toward a more integrated, life-centered worldview. The journey ahead demands intellectual openness and courage, but the rewards promise a richer understanding of evolution and a more harmonious coexistence with the living Earth we call home. In embracing this unfolding vision, we are invited not only to rethink evolution but to participate consciously in life's ongoing creation.

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