

# **Form Without Blueprint**

## *Dynamic Morphogenesis Beyond Platonic and Information-Theoretic Models*

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### **Abstract**

Recent work on bioelectric morphogenesis, particularly by Michael Levin, has shown that biological systems are capable of stabilizing robust, goal-directed body forms and restoring them after severe perturbations, without these forms being genetically or informationally fully encoded. To describe these phenomena, reference is often made to a structured space of possible forms—a so-called morphospace or “platonic space.”

The present contribution situates these empirical findings within a broader theoretical framework developed over more than two decades, which addresses the emergence of order, form, and stability beyond representational, information-theoretic, and teleological models. The point of departure of this work is an operator-theoretic conception of emergence, in which form is not understood as a predefined target structure, but as a temporary stabilizing achievement of dynamic processes. In this context, a spiral-based representation of morphogenesis was already developed in 2005, which is taken up again in this paper not as a historical artifact, but as a theoretical diagram with systematic intent.

In the underlying model, morphologies do not exist as ideal forms or as stored information. They emerge as local condensations within a continuous dynamic process structured by parameters such as density, velocity, coupling intensity, and energetic binding. Goal-directedness appears in this framework not as an expression of purpose or planning, but as the operative maintenance of stable states under changing conditions.

Through an operator-theoretic rereading of current findings in bioelectric morphogenesis, it is shown that the concept of morphospace discussed today implicitly refers to precisely the dynamic logic that has been elaborated in the author’s long-term work on emergence, non-objectivity, and world-stabilization. The spiral representation thus functions not as a metaphor, but as a structural description of a space of possibilities from which morphologies arise, without recourse to blueprint assumptions, informational storage, or ontological Platonism.

This perspective clarifies the ontological status of morphospace, limits information-theoretic overextensions, and positions intelligence not as the origin of form, but as a secondary

stabilizing achievement of emergent order. In doing so, a theoretical connection is established between dynamic morphology, bioelectric regulation, and a non-representational theory of emergence and intelligence.

The aim of this contribution is not the elaboration of a complete theory, but the conceptual repositioning of a current empirical problem.

*(This paper is an interface text. The author's primary research corpus employs an autistic, non-linear, rhythmically recursive writing mode that cannot be fully preserved in academic English without structural loss of epistemic function.)*

**The perspective outlined here is part of a larger, modularly structured research framework:**

Speed, T. (2025). Mortality as Emergence Collapse - An Operator-Theoretic Reading of Bioelectric Morphogenesis (2 English). Zenodo. <https://doi.org/10.5281/zenodo.17964441>

Speed, T. (2025). Beyond Intelligence - Emergence, Operator Relativity, and an Autistic Epistemology (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18068128>

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Speed, T. (2025). Artificial Systems Without World - Why World-Formation and Technical Usability Are Structurally Incompatible - Ontological Limits of Artificial Intelligence in Light of ANP, MNO, and Observer Structure (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18006914>

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Speed, T. (2025). From Objects to Responses - On the Loss of Ontological Sovereignty in Contemporary Physics (Version 1). Zenodo. <https://doi.org/10.5281/zenodo.18017629>

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Speed, T. (2025). The Constructed Observer - World-Formation Beyond Representation - Why Perception Is Not Representation, but a Structural Achievement (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18006170>

Speed, T. (2025). The All–Nothing Paradox - Ontological Openness as a Condition of World-Formation - Why Closure – Not Complexity – Marks the Limit of Artificial Systems (2 English). Zenodo. <https://doi.org/10.5281/zenodo.18000820>

## **1. Introduction: The Problem of Goal-Directed Form**

The question of how stable, goal-directed forms arise in biological systems belongs to the most persistent problems of modern natural and life sciences. While classical explanatory models primarily conceive of morphology as the result of genetic programs, molecular signaling pathways, or information-processing mechanisms, empirical findings increasingly challenge this perspective at a fundamental level. In particular, phenomena of robust regeneration, error correction after severe perturbations, and the coordination of biological processes across scales cannot be adequately described as the execution of a predefined blueprint.

A prominent expression of this challenge can be found in current research on bioelectric morphogenesis, for example in the work of Michael Levin. Here it is shown that cells and tissues are capable of steering toward and reconstructing collective target states even when local information, genetic structures, or causal pathways are destroyed or experimentally manipulated. The stability of form thus appears not to be bound to individual components, but to a higher-order organizational logic that eludes direct localization.

In order to theoretically capture these findings, reference is often made to the notion of a structured space of possibilities within which biological systems “find,” “navigate,” or “restore” forms. Terms such as morphospace or platonic space are intended to express that form does not arise solely from local causality, but from a global order of possible states. At the same time, however, it often remains unclear what ontological status such a space possesses: Is it a really existing reservoir of forms, an abstract description of functional relations, or a metaphorical bridge between dynamics and goal-directedness?

It is precisely at this point that the present contribution intervenes. It understands current debates on morphospace not as an isolated novelty, but as the empirical manifestation of a deeper problem that has been systematically addressed in the author’s work for more than two decades: the question of how order, form, and stability can arise without recourse to representational models, informational storage, or teleological assumptions of purpose. This work initially developed outside classical disciplinary contexts, within the framework of artistic and neurodivergent research, but from the outset aimed at a general theory of dynamic order.

At the center of this theoretical framework stands an operator-theoretic conception of emergence. Order is not understood here as an object, structure, or information, but as the effect of an operative response to structural non-identity. Form does not arise because it is given, stored, or planned, but because dynamic processes under certain conditions develop a

sufficient degree of self-binding to become stable. Goal-directedness, in this sense, is not an expression of purpose or intention, but a consequence of successful stabilization.

Already in 2005, a spiral-based representation of morphogenesis was developed within this framework, describing form formation as the result of continuous dynamics. This representation is not to be understood as a metaphor or visualization, but as a theoretical diagram: it models a space of possibilities in which morphologies emerge as local condensations and temporary attractors, depending on parameters such as density, velocity, coupling intensity, and energetic binding. Forms do not appear as target points, but as holdable states within a flow.

The aim of this paper is to explicitly relate this dynamic conception of morphology to current empirical findings on bioelectric regulation and to examine the implicit ontological assumptions of the morphospace concept. It is argued that many of the phenomena observed today become conceptually coherent only if morphospace is understood not as an ontological space, but as the operative reachability of dynamic stability. In this reading, intelligence does not appear as the origin of form, but as a secondary capacity for navigating and maintaining emergent order.

## 2. Bioelectric Morphogenesis and Target States

The empirical challenge motivating the present contribution becomes particularly clear in research on bioelectric morphogenesis. In the work of Michael Levin, it is shown that morphological order in living systems does not arise solely from genetic regulation or molecular signal transduction. Instead, spatially distributed bioelectric states—particularly membrane potentials, ion gradients, and electrical coupling between cells—play a central role in the stabilization and reconfiguration of body forms.

These bioelectric patterns do not function merely as local signals, but as global coordination structures. They enable biological systems to return to stable, functional forms after major interventions—such as tissue loss, cellular rearrangement, or experimental manipulation. Crucially, this return cannot be explained as a renewed genetic “execution” of a blueprint. Rather, the systems appear to possess a form of target reference that remains effective independently of the specific local material configuration.

Levin frequently describes these target references as *morphogenetic target states*. These target states are not punctually localized and are not fully stored in individual components. Instead, they manifest as collective tendencies of the system to detect and correct deviations. Morphological order thus appears not as a one-time result of a developmental process, but as an ongoing achievement of self-regulation.

In order to capture these phenomena, Levin draws on the notion of a structured space of possibilities in which different forms are laid out as realizable states. The commonly used concept of *morphospace* or a “platonic space” is intended to indicate that biological systems do not respond arbitrarily, but operate within a limited space of stable organizational forms. Forms are not constructed within this space, but rather approached or rediscovered.

It is precisely at this point, however, that a conceptual tension becomes apparent. On the one hand, it is explicitly emphasized that target states do not exist as genetically encoded instructions or as stored information. On the other hand, it remains unclear what it means for such states to “exist” or to be “addressable” at all. Morphospace thus often functions as a necessary but underdetermined theoretical instance: it is indispensable for describing the empirical findings, yet resists a clear ontological determination.

This underdetermination is not a shortcoming of the empirical research, but points to a categorical boundary. The bioelectric experiments show that systems can act in a goal-directed manner without specifying how this goal-directedness is to be ontologically located. If morphospace is understood as a really existing space of ideal forms, a regression to Platonic ontologies threatens. If, by contrast, it is read merely as a heuristic construct, it loses its explanatory force.

The present contribution proposes not to resolve this tension by further ontologizing morphospace, but by shifting the question itself. Rather than asking what morphospace *is*, the question becomes under which operative conditions target states can be stably addressable. Goal-directedness then appears not as access to a predefined inventory of forms, but as an effect of dynamic stabilization within an open space of possibilities.

In this perspective, bioelectric states do not function as representations of forms, but as operative media of self-binding. They hold the system in a condition in which certain morphological configurations remain reachable and reproducible. The focus thus shifts from the existence of target states to the conditions of their durability.

This shift prepares the ground for the dynamic reading of morphology developed in the following section. There it is shown that the spiral-based representation of morphogenesis developed at an early stage explicates precisely the operative logic that becomes empirically visible in bioelectric research, without being conceptually fully articulated there.

### **3. Dynamic Morphology Prior to Morphospace**

The empirical findings on bioelectric morphogenesis described in Section 2 suggest that morphological order can be understood neither as a linear developmental sequence nor as the execution of a coded blueprint. Forms instead prove to be stable yet in principle revisable states within an open dynamic process. This insight, however, is not solely the result of recent biological research, but was theoretically anticipated much earlier within the work underlying the present contribution.

Since the early 2000s, the author's work has maintained a continuous focus on the question of how order, form, and stability can arise from dynamics without recourse to representational, information-theoretic, or teleological models. The point of departure was not biology in the narrow sense, but a more general investigation of creative, social, cultural, and natural systems that exhibit similar patterns of self-organization. Within this framework, morphology was from the outset understood not as a property of things, but as an effect of dynamic processes.

A central expression of this perspective is the spiral-based representation of morphogenesis developed in 2005, which is for the first time explicitly situated in a natural-scientific and theoretical context in the present contribution (Fig. 1 / 48/47). The graphic emerged within the framework of artistic and neurodivergent research, yet was from the beginning conceived as a structural model rather than a metaphorical illustration or aesthetic symbolism.

Abb. 48: Die Entstehung einer organischen Form in der Evolutionsspirale

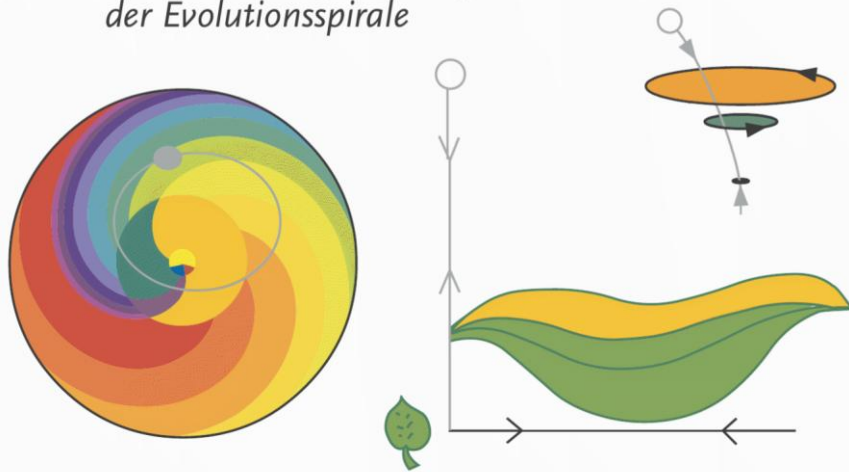
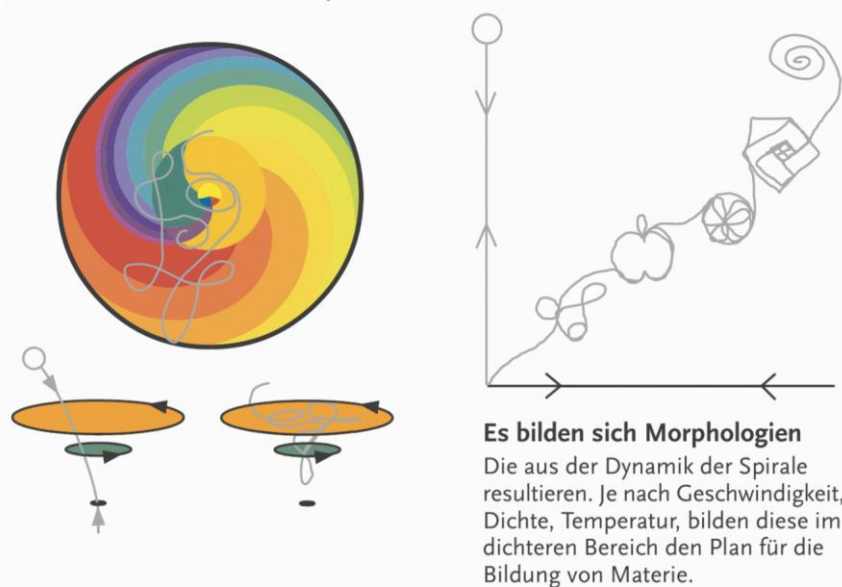


Abb. 47: Die dynamische Entstehung von Morphologien in der Evolutionsspirale



**Es bilden sich Morphologien**

Die aus der Dynamik der Spirale resultieren. Je nach Geschwindigkeit, Dichte, Temperatur, bilden diese im dichteren Bereich den Plan für die Bildung von Materie.

**Fig. 1 (48/47):** The dynamic emergence of morphologies in the evolutionary spiral.

Images are taken from the book *Gesellschaft ohne Vertrauen – Die Grundlagen einer kreativen Gesellschaft*, published in 2005.

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Originally published in German.

The spiral or sphere does not function in this representation as a form or a goal, but as a generator of a continuous dynamic space of possibilities. Along this dynamic, morphologies do not emerge as predefined shapes, but as local condensations and temporary stabilizations. Crucially, the spiral itself contains no forms. It describes a movement, a flow, within which certain configurations become holdable under suitable conditions.

In the graphic, this logic is rendered visible through multiple layers. The spiral movement is linked to parameters such as density, velocity, and energetic intensity. Morphological expressions arise where these parameters enter a range of sufficient self-binding. Forms thus do

not emerge uniformly everywhere, but preferentially in zones of increased stability—as attractors within an otherwise open dynamic field.

These morphologies are neither final nor privileged. They can change, dissolve, or newly emerge as soon as the underlying dynamic conditions shift. What is decisive is that form does not exist independently of the dynamics. It is not a target point toward which the process moves, but a state that persists only as long as the process sustains it. Order thus appears not as a stored structure, but as an ongoing achievement.

It is noteworthy that this model operates entirely without the assumption of a blueprint, an explicit target representation, or an ontologically autonomous space of forms. There is neither a storage location for form nor an instance that “knows” form within the representation. What exists is solely the dynamics itself and its capacity to generate stable configurations under certain conditions.

It is precisely here that the systematic connection to current concepts of morphospace becomes apparent. What is described there as navigation within a space of possible forms appears in the spiral-based representation as the operative reachability of stable states within a continuous process. The space of possibilities is not a separate ontological domain, but is identical with the structure of the dynamics itself. Forms therefore do not need to be “found” or “retrieved”; they arise as effects of self-organization.

The spiral-based representation thus makes explicit what remains implicit in many current debates: that goal-directedness in morphogenesis does not presuppose the existence of target states as entities. It merely presupposes that dynamic processes are capable of binding themselves in such a way that certain states become reproducible and corrigible. Morphology, in this sense, is not an object, but an event with duration.

In the next section, this structural reading of the graphic is further specified. It is shown how individual elements of the representation—particularly the distinction between dynamic flow and local stabilization—can be systematically related to current findings in bioelectric regulation, and how a non-Platonic, operatorial determination of morphospace follows from this.

This early representation deliberately remains at a structural level and is only later specified in operatorial terms in subsequent works.

#### **4. Morphology as an Operatorial Process: From Early Dynamics to Explicit Theory**

The spiral-based representation of morphogenesis introduced in the previous section is not to be understood as an isolated early work, but as an early condensation of a theoretical perspective that was systematically further developed in the author’s later work. The aim of this section is not to present this theory in its entirety, but to make visible those structural assumptions that allow current findings in bioelectric morphogenesis to be conceptually situated without recourse to Platonic or information-theoretic models.

What these works share is the assumption that form does not arise from representation, planning, or target specification, but from the operative dynamics of a system capable of holding difference and temporarily stabilizing it. In this perspective, morphology does not appear as an object or a goal, but as an event with duration: as a state that exists only as long as the underlying dynamics sustain it.

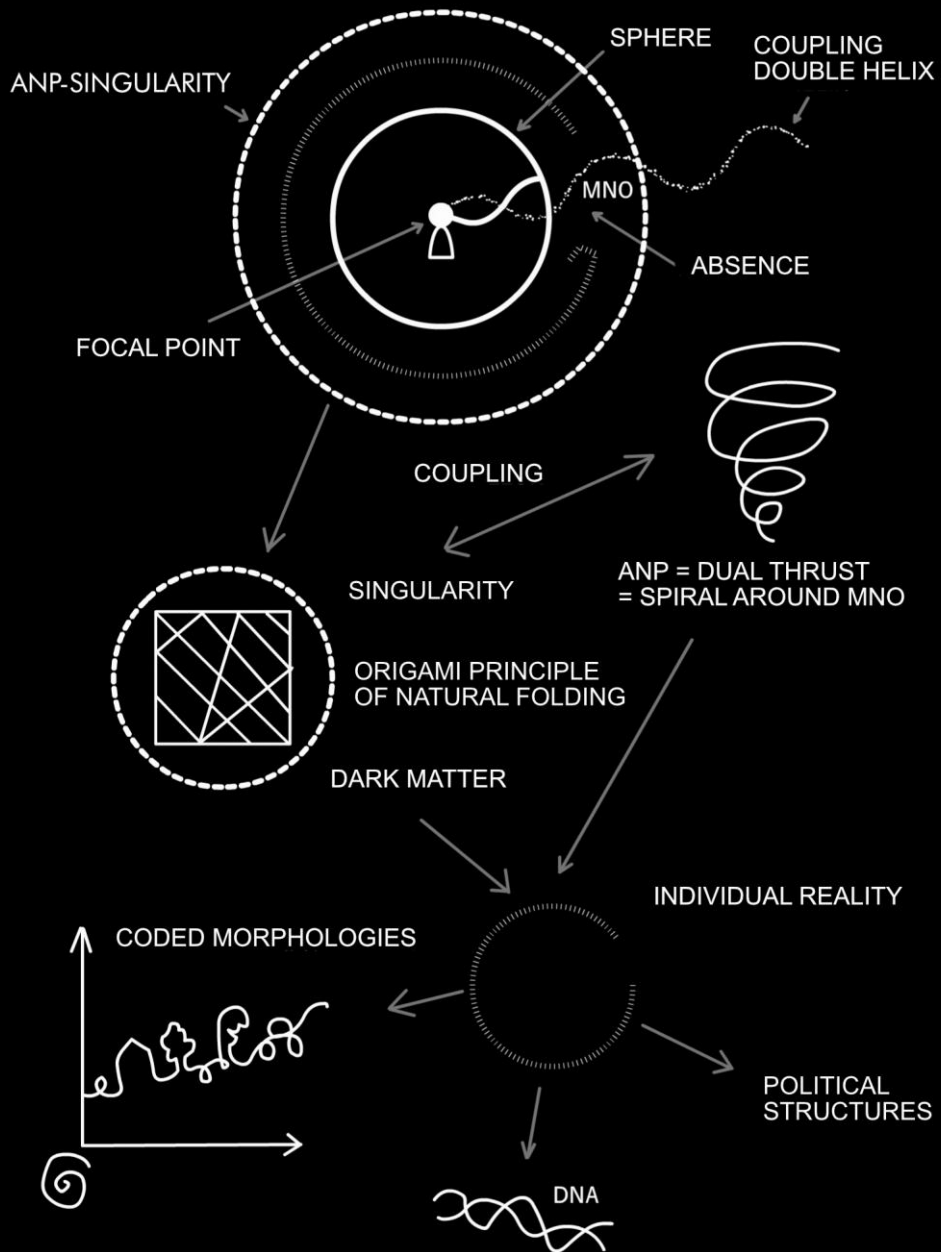
This basic assumption was specified over the years in different contexts, among them *The Physics of the Poor* (2016) as well as later operator-theoretic works. There, emergence is not understood as a continuous developmental process, but as a qualitative transition, in which a system forms a new, stable order out of an open space of possibilities. What is decisive here is not the emergence of a form as such, but the system's capacity to maintain this form against disintegration.

The early spiral graphic (Fig. 1) expresses this logic in an elementary manner: the spiral does not function as a form or a goal, but as a generator of a continuous dynamic space of possibilities. Morphologies emerge within it as local condensations, preferentially in regions of increased stability. The graphic deliberately contains no storage location for form and no instance that "knows" form. Order is not deposited here, but enacted.

A further specification of this idea can be found in a later representation from *The Physics of the Poor* (2016), in which the spiral or sphere appears not only as a dynamic space of possibilities, but explicitly as an interface between openness and stabilization (Fig. 2). While the early graphic illustrates the process of form formation arising from dynamics, the later representation shifts the focus to the condition of the durability of emergent order. Morphologies are not understood here as end products, but as results of an ongoing coupling between possibility and actualization.

**Fig. 2:** Schematic representation of emergent order as the coupling between openness and stabilization (Speed 2016 / *The Physics of the Poor*, DOI: 10.5281/ZENODO.17803906 / ISBN: 3695191287).

# REALITY EYE



It is important to emphasize that this later representation is likewise not to be read as a model in the representational sense. It does not claim to depict biological or physical processes, but rather marks a structural relation: form emerges where dynamics are not fully discharged, but remain bound in a way that allows repetition, correction, and reconfiguration.

In this sense, the two graphics can be read as complementary interfaces of the same theoretical approach. The early spiral makes visible that morphology arises from dynamics without reliance on target specifications. The later representation specifies that this dynamic presupposes an operative capacity for stabilization that cannot be equated with representation or information. Both thus point to an understanding of morphology as an emergent process whose order is not given, but must be continually produced anew.

For the current discussion of morphospace, this means that the space of possible forms need not be conceived as an independent ontological domain. Rather, it can be understood as an expression of the operative structure of a system: as the range of those states that are reachable and stabilizable under given dynamic conditions. In this reading, morphospace does not designate a collection of ideal forms, but the practical openness of a system to variation and correction.

The operative concept of morphospace proposed here is structurally identical to the shift elsewhere undertaken from the concept of intelligence to emergence: what is primary is not performance within stable spaces of possibility, but the operative condition of their stabilization.

The approach outlined here differs from classical theories of self-organization and process ontologies in that order is not understood as a property of processes, but as an operative achievement of stabilization.

The present contribution can only sketch this operatorial perspective. A comprehensive theoretical elaboration would exceed the scope of this paper and has been carried out elsewhere. For the present purpose, it suffices to note that the goal-directedness observed in bioelectric morphogenesis can be understood without recourse to Platonism or blueprint assumptions if form is conceived as the temporary stabilization of dynamic processes.