How the World Becomes Determinate:
Synchronicity, constraint, and the ontology of relations

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Abstract:
Persistent difficulties in quantum mechanics, biosemiotics, and artificial intelligence suggest a shared limitation of a dominant ontological formalism that presupposes determinate entities, intrinsic identity, and explanation through efficient causation. This paper develops a relational, processual ontology in which determinacy and significance emerge through formally causal processes of symmetry breaking, constraint, and synchronization. Probability is reinterpreted non-epistemically as a measure of relational compatibility rather than uncertainty about pre-existing states, and identity is understood as relationally enacted through participation in coordinated systems. These claims are realized across quantum measurement, biological sign activity, and large language models, showing classical ontology to be incomplete rather than false.

Keywords:
Relational ontology; formal causation; symmetry breaking; probability; identity; significance

1. Introduction

For much of its history of informing modern science, the dominant ways in which philosophy has been interpreted and applied have relied on a relatively stable ontological formalism. This formal regime—often left implicit rather than explicitly defended—treats the world as composed of individual objects bearing properties, standing in relations that are secondary to the objects themselves. Change, on this view, is explained primarily in terms of efficient causation: one event produces another; one state of affairs gives rise to the next. Significance, probability, and determinacy are typically understood as attributes of already-constituted entities or as reflections of our epistemic access to them.

This classical ontological regime has been remarkably successful. It underwrites large parts of everyday reasoning, much of classical physics, and many dominant approaches in philosophy of language, mind, and science. Because of this success, its core assumptions often go unexamined. They function as a background against which problems are posed and solutions are evaluated, rather than as hypotheses that themselves require justification.

However, a growing range of phenomena now sit uneasily within this framework. Developments in quantum mechanics have long challenged the assumption that physical systems always possess determinate properties independent of measurement, revealing instead a dependence on experimental context that resists straightforward object-based description. In a different domain, work in biosemiotics has increasingly emphasized that even the most basic biological processes involve sign activity, context-sensitive coordination, and functional relevance in ways that cannot be reduced to object-centered mechanisms or efficient causation alone. More recently, advances in artificial intelligence—particularly the emergence of large language models (LLMs)—have raised parallel difficulties for classical accounts of significance, representation, and understanding, as coherent linguistic behavior appears without any clear locus of stored semantic content.

In all three domains, attempts to preserve classical ontology by adding supplementary mechanisms—hidden variables, internal representations, latent semantic contents, or encoded significations—tend to reproduce familiar paradoxes rather than resolve them. Whether the problem takes the form of the measurement problem in quantum mechanics, the attribution of semantic content to artificial systems, or the emergence of significance that is functionally indexed to living systems, the underlying difficulty is the same: classical ontology presupposes determinate entities and relations where what is at issue is the very production of determinacy itself.

The aim of this paper is to undertake a systematic reconsideration of these assumptions. Rather than proposing a local theory tailored to any one of these domains, we argue that quantum mechanics, biosemiotics, and large language models all point toward a more general ontological shift: from an ontology centered on objects and efficient causation to one centered on relations, processes, and formal constraint (Rogers T. M., 2025) (Rosen, 1991). This shift is not merely terminological or pragmatic. It involves a different conception of what it means for something to be determinate, stable, or real.

At the center of this alternative approach is the idea that determinacy is not always a pre-existing feature of the world waiting to be discovered, nor merely a reflection of our ignorance. In some systems, determinacy is produced through interaction. Stable outcomes—whether physical measurement results, coherent patterns of meaning in artificial systems, or functional signs in living organisms—emerge through processes that reorganize a space of possibilities rather than select among already distinguished alternatives. To understand such systems, we need concepts that can describe how possibilities become structured, how stability arises without stored representations, and how constraint can operate as a genuine form of causation.

This paper advances a relational, processual, formal ontology designed to meet these needs. The formalism treats relations as ontologically primary, regards probability structures as constraints on what can coherently occur, and understands stability as the ability to re-enter coordinated regimes rather than the persistence of object properties. A key role is played by symmetry and symmetry breaking, understood not as metaphors or merely physical mechanisms, but as expressions of formal causation: changes in the structure of admissible relations that make new forms of determinacy possible.

The argument of the paper proceeds in stages, mirroring the very process it seeks to describe. We begin by making explicit the commitments of classical ontology and examining why they form a stable explanatory regime. We then identify points at which this regime becomes unstable, introducing the notions of symmetry, symmetry breaking, and formal causation as operators that destabilize classical assumptions. Finally, we articulate a new ontological framework in which determinacy arises through cycles of relational destabilization and re-stabilization, and we show how this formalism is realized in three distinct but structurally analogous domains: quantum mechanics, biosemiotics, and large language models.

By placing these cases side by side, the paper aims to demonstrate that the proposed ontology is not a domain-specific reinterpretation but a general metaphysical orientation. What is at stake is not how to interpret a particular theory or technology, but how to understand systems in which significance, measurement, and functional organization emerge through interaction rather than representation. The goal is to provide a coherent conceptual foundation for such systems—one that does justice to their behavior without forcing them back into an ontological mold that no longer fits.

2. The Classical Ontological Regime

Before proposing an alternative, it is important to clarify what we mean by the *classical ontological regime*. The target here is not a single philosophical doctrine, nor philosophy as a discipline in its full diversity, but a relatively stable ontological formalism that has guided how philosophical concepts have been interpreted and operationalized across physics, biology, and formal computational systems. This formalism has provided the default background against which explanation, causation, and determinacy have been understood.

At the core of this regime is a simple but powerful picture. The world is taken to be composed of individual entities—objects, systems, or states—that possess determinate properties. Relations are understood as secondary: they connect entities that are already fully specified. Change is explained primarily through efficient causation, whereby one determinate state gives rise to another through a chain of interactions. On this view, explanation proceeds by identifying the entities involved, specifying their properties, and tracing the causal mechanisms that link them over time.

This ontological formalism brings with it a characteristic way of understanding determinacy. Determinate properties are assumed to exist prior to interaction, measurement, or interpretation. When determinacy is not accessible, this is typically treated as a limitation of knowledge rather than as a feature of the system itself. Probability, accordingly, is most often interpreted epistemically: as a measure of uncertainty about which determinate state actually obtains. Even when probabilistic formalisms are indispensable, they are commonly understood as tools for managing ignorance rather than as expressions of ontological structure.

Within this regime, significance and meaning are likewise treated as properties or contents that can, in principle, be localized. In physical systems, significance is not usually thematized at all, since outcomes are assumed to be fully characterized by objective properties. In biological systems, functional relevance is often reduced to mechanistic role or adaptive outcome. In artificial formal systems, especially computational ones, meaning is typically attributed by positing internal representations or encoded semantic content. In each case, significance or meaning is treated as something *added to* an otherwise complete description of objects and mechanisms.

The strength of this classical regime lies in its coherence and generality. It offers a unified explanatory template that can be applied across domains with minimal modification. Once entities, properties, and causal relations are specified, the same basic form of explanation can be repeated. This repeatability has contributed greatly to the regime's stability. It is not merely a philosophical position but an entrenched way of organizing inquiry, modeling systems, and interpreting formal results.

However, this very stability can obscure the formal commitments on which the regime depends. By taking determinate entities as given, the classical ontological formalism leaves little conceptual room for situations in which determinacy itself is at issue. When faced with systems whose behavior appears to depend on context, interaction, or relational coordination in a fundamental way, the default response is to search for hidden variables, latent structures, or unobserved mechanisms that would restore determinate objecthood. The formalism thus resists change by absorbing anomalies rather than rethinking its starting assumptions.

This resistance is especially evident when classical ontology is extended beyond the domains in which it originally proved effective. As we will see in the following sections, quantum mechanics, biosemiotics, and artificial intelligence each expose limits of the classical formalism in different but structurally similar ways. In these cases, what appears to be missing is not another entity, property, or mechanism, but a way of accounting for how determinacy, significance, and stability can emerge through interaction rather than pre-exist it.

For now, the crucial point is that the classical ontological regime is not simply "wrong." It is a highly effective and internally consistent formalism that has shaped much of modern thought. The task ahead is not to discard it wholesale, but to understand where and why its assumptions cease to be adequate—and what kind of ontological reconfiguration is required when they do.

3. Points of Tension

The classical ontological formalism described in the previous section remains powerful precisely because it has been able to accommodate a wide range of phenomena without revising its core assumptions. Yet this adaptability has limits. In certain domains, the effort to preserve determinate entities, object-centered explanation, and efficient causation begins to generate persistent tensions. These tensions do not arise from experimental error, incomplete data, or insufficient modeling, but from a mismatch between the formal commitments of the classical regime and the kinds of systems under investigation.

What is striking is that these tensions arise independently in domains that differ radically in subject matter and scale. Quantum mechanics, biosemiotics, and artificial intelligence each confront the classical formalism with situations in which determinacy, significance, and stability appear to depend fundamentally on interaction and context. The recurrence of this pattern suggests that the difficulty is not domain-specific but ontological.

3.1 Quantum Mechanics

In quantum mechanics, the tension is most clearly expressed in the measurement problem. Classical ontology presupposes that physical systems possess determinate properties independently of observation or interaction, even if those properties are temporarily inaccessible. Quantum phenomena resist this presupposition. Experimental outcomes appear to depend irreducibly on measurement context, and attempts to treat indeterminacy as merely epistemic quickly encounter contradictions.

From within the classical formalism, this dependence on measurement is puzzling. Measurement is supposed to reveal pre-existing properties, not participate in their formation. As a result, explanatory strategies tend to multiply unseen mechanisms—hidden variables, additional dimensions, or privileged observational frames—in order to preserve determinate objecthood. These strategies differ in detail, but they share a common aim: to restore the classical picture by relocating determinacy rather than questioning its prior existence.

Despite their ingenuity, such approaches leave a residual unease. The formal structure of quantum theory itself continues to resist a straightforward object-property interpretation, suggesting that the tension lies not in how we interpret particular results, but in the ontological assumptions we bring to the theory.

3.2 Biosemiotics

In biosemiotics, the tension takes a different but structurally related form. Living systems exhibit behavior that is not well described solely in terms of mechanical interaction or efficient causation. Biological processes are organized around functional relevance: signals matter to organisms, not merely as physical stimuli, but as components of coordinated activity. This introduces significance—indexed to the organism and its ongoing viability—as an irreducible feature of biological organization.

Classical ontology tends to assimilate such phenomena by reducing them to biochemical mechanisms or evolutionary outcomes. While these explanations capture important aspects of biological function, they often struggle to account for how relevance and coordination arise in real time within living systems. Treating significance as an after-the-fact interpretation imposed by observers fails to explain why organisms themselves behave as if certain interactions matter more than others.

Here again, the difficulty is not a lack of mechanistic detail, but the absence of a formal framework in which significance can be understood as something that emerges through relational organization rather than being added to an otherwise complete description of objects and processes.

3.3 Artificial Intelligence

In artificial intelligence, particularly in the case of large language models, the tension becomes especially visible because it concerns systems whose internal structure is fully specified. Classical accounts of meaning and understanding typically rely on the presence of internal representations that carry semantic content. Yet large language models exhibit coherent linguistic behavior without any clear locus of stored meaning or interpretive agency.

Attempts to reconcile this behavior with classical ontology often take one of two forms. Either meaning is attributed externally, as something projected by users onto an otherwise syntactic system, or it is posited internally, in the form of latent semantic representations inferred from statistical structure. Both approaches preserve the assumption that meaning must be localized as a property of some entity, whether internal or external to the system.

What remains unexplained, however, is how stable patterns of linguistic significance arise through interaction alone. The coherence observed in LLM-mediated dialogue appears to depend on relational coordination between model outputs, user inputs, and contextual constraints, rather than on the retrieval of pre-existing semantic content. This places strain on the classical formalism, which lacks the conceptual resources to describe significance as something that is produced and stabilized through interaction.

3.4 A Shared Structural Difficulty

Although the specific phenomena differ, the underlying tension in all three domains is the same. Classical ontology presupposes determinate entities and relations as the starting point of explanation, whereas quantum mechanics, biosemiotics, and artificial intelligence confront us with systems in which determinacy, significance, and stability appear to be outcomes rather than premises.

In each case, the dominant response has been to extend the classical formalism by adding layers of complexity—additional variables, representational structures, or interpretive frameworks—while leaving its foundational assumptions intact. The persistence of tension across domains suggests that this strategy has reached its limits. What is required is not another refinement within the existing regime, but a reconsideration of the formal assumptions that define what counts as an entity, a relation, and an explanation in the first place.

The next sections take up this task. Rather than attempting to resolve these tensions within the classical ontological formalism, we will examine how concepts such as symmetry, symmetry breaking, and formal causation can be used to destabilize its assumptions and open the way toward a relational, processual alternative.

4. From Anomaly to Ontological Crisis

The tensions identified in the previous section are often treated, within their respective fields, as localized anomalies. In quantum mechanics, they are framed as interpretive puzzles. In biosemiotics, they are sometimes regarded as conceptual complications at the interface of biology and philosophy. In artificial intelligence, they are frequently described as gaps in our current understanding of representation, learning, or semantics. Considered in isolation, each of these difficulties appears tractable within its own domain.

Taken together, however, they point to a deeper problem. The recurrence of structurally similar tensions across such disparate domains suggests that what is at stake is not a collection of independent anomalies, but a limitation in the ontological formalism that has guided their interpretation. When phenomena repeatedly resist explanation despite advances in theory, experiment, and computation, it becomes necessary to ask whether the difficulty lies not in what we know, but in how we have formalized what it means to explain.

What unifies these cases is a shared pattern of breakdown. In each domain, classical ontology presupposes that determinacy precedes interaction: that physical properties exist prior to measurement, that biological function can be reduced to object-level mechanisms, and that linguistic significance must be grounded in internal representations. Yet in each case, determinacy appears instead to be *produced* through interaction—through measurement contexts, organism–environment coordination, or dialogical constraint. The formalism assumes what the phenomena call into question.

This situation marks the transition from anomaly to ontological crisis. An anomaly can be accommodated by extending existing explanatory resources while leaving foundational assumptions intact. An ontological crisis arises when those assumptions themselves become the source of persistent explanatory strain. In the present case, repeated efforts to preserve object-based ontology by adding hidden variables, encoded meanings, or mechanistic surrogates for significance have not eliminated the tensions; they have merely displaced them.

This diagnosis has been developed explicitly in prior work on relational formal ontology, where it is argued that classical object-centered formalisms systematically mislocate determinacy by treating it as an intrinsic property rather than as an emergent outcome of relational organization (Rogers T. M., 2025). From this perspective, the problem is not that relations are missing from classical ontology, but that relations are treated as secondary to entities whose determinacy is already fixed. The phenomena under consideration instead require a framework in which relations play a constitutive role.

A similar point has been made, from a different angle, in relational approaches to biology. Rosen's analysis of living systems emphasizes that organization and function cannot be reduced to efficient causal chains among components, because what matters biologically is the relational closure that makes a system viable as a system (Rosen, 1991). The relevance of this insight here is not biological per se, but formal: it shows that there are domains in which explanatory adequacy depends on recognizing organization and constraint as ontologically primary rather than derivative.

Semiotic considerations further sharpen the crisis. In biosemiotics (Rosen, 1991) (Rogers T. , 2024) and in human–machine interaction (Rogers T. M., 2026 February) alike, significance is not an optional interpretive overlay but a functional feature of system behavior. Peircean semiotics, as developed within a relational formal ontology (Rogers T. , 2022), provides a vocabulary for understanding how significance can arise through mediation and habit rather than through encoded content. The difficulty classical ontology encounters in accommodating significance is thus not accidental; it stems from a formalism that lacks the resources to treat mediation and constraint as generative.

Seen in this light, the convergence of tensions across quantum mechanics, biosemiotics, and artificial intelligence is not coincidental. These domains differ in scale, material substrate, and historical development, yet they all expose the same fault line: the assumption that explanation must begin with determinate entities and proceed by efficient causation alone. When determinacy, significance, and stability instead emerge through interaction, this assumption becomes untenable.

Recognizing this convergence does not yet tell us what an alternative ontology should look like. It does, however, clarify what it must accomplish. Any adequate framework must be able to describe how determinacy is produced rather than presupposed, how significance can arise without being encoded, and how stability can be achieved without being stored. Addressing these requirements will require a shift away from the classical ontological formalism and toward a relational, processual account in which constraint and form play a central causal role.

The next section begins this transition explicitly. By introducing symmetry, symmetry breaking, and formal causation, we move from diagnosis to reconstruction—identifying conceptual tools capable of destabilizing the classical regime and opening space for a new ontological configuration.

5. Symmetry, Symmetry Breaking, and the Limits of Efficient Causation

The ontological crisis identified in the previous section calls for conceptual resources capable of describing how determinacy and significance are produced rather than presupposed. One such resource is the notion of symmetry. Although symmetry is often associated with specific physical theories, its relevance here is broader and more fundamental. Symmetry names a condition of equivalence: a situation in which multiple transformations or configurations are indistinguishable with respect to a given description. When a system exhibits symmetry, no particular distinction is privileged; multiple possibilities coexist without differentiation.

From the perspective of classical ontology, symmetry is typically treated as a descriptive feature of already-determinate entities or laws. Symmetry breaking, correspondingly, is understood as the result of an efficient cause that selects one outcome from among many equivalent alternatives. On this view, symmetry breaking is something that *happens to* a system whose underlying structure remains ontologically unchanged.

The phenomena under consideration in this paper require a different understanding. In quantum mechanics, biosemiotics, and artificial intelligence alike, the critical issue is not the selection among pre-defined alternatives, but the emergence of distinguishability itself. Prior to measurement, interaction, or coordination, the relevant distinctions are not merely unknown; they are not yet available as distinctions. Symmetry, in these cases, characterizes a pre-individuated relational field rather than a set of hidden determinate states.

Symmetry breaking, understood in this sense, is not primarily an efficient causal event. It is a *formal transformation* in which the space of admissible relations is restructured so that certain distinctions become possible and others do not. What changes is not merely the state of a system, but the form of organization that determines what counts as a state in the first place. Symmetry breaking thus operates at the level of constraint rather than mechanism.

This shift exposes the limits of efficient causation as the sole explanatory principle. Efficient causation presupposes determinate relata: events that act upon one another to produce effects. It can describe transitions between already-formed states, but it cannot by itself account for the emergence of the very distinctions that define those states. When determinacy is the outcome of interaction rather than its prerequisite, explanation must appeal to a different mode of causation.

Formal causation provides such a mode. Rather than producing effects by acting on entities, formal causation operates by shaping the space of possibilities within which entities and events can appear. It determines what kinds of coordination are admissible, what patterns can stabilize, and what distinctions can persist. In this sense, formal causation is not opposed to efficient causation; it is prior to it. Efficient causal processes unfold within a form that they do not themselves generate.

Symmetry breaking is the primary expression of formal causation in the present framework. When a symmetry breaks, a previously undifferentiated relational field acquires structure. Certain relations become stabilized, others are excluded, and a new regime of coordination emerges. This regime can then support efficient causal processes, but its formation cannot be explained in efficient terms alone.

This perspective also clarifies why attempts to resolve the tensions discussed earlier by adding hidden mechanisms or representational structures tend to fail. Such strategies remain committed to efficient causation and object-based ontology, treating symmetry breaking as a secondary effect rather than as a constitutive transformation. As a result, they reintroduce the very assumptions that generated the crisis. By contrast, treating symmetry breaking as a formally causal process allows us to describe how determinacy and significance can emerge without being encoded or selected in advance. It opens conceptual space for understanding measurement outcomes, biological relevance, and coherent linguistic behavior as products of relational reorganization rather than as revelations of pre-existing content.

The next section develops this idea further by examining how symmetry breaking operates through formal causation. In doing so, we move closer to a positive account of how stable regimes of determinacy and significance are produced and sustained across interaction, setting the stage for a fully relational, processual ontology.

6. Formal Causation and Relational Decoherence

If symmetry breaking names the emergence of new distinctions within a relational field, formal causation names the mode of causality through which such emergence becomes formally expressible. Together, they provide the conceptual resources needed to explain how determinacy and significance arise without being presupposed. However, to complete the transition away from the classical ontological formalism, it is necessary to account not only for the formation of new regimes, but also for the destabilization of existing ones. This is the role of what we will call *relational decoherence*.

Formal causation, as introduced in the previous section, operates by shaping the space of admissible relations rather than by producing effects through direct interaction among determinate entities. It determines which patterns of coordination can persist, which distinctions are sustainable, and which forms of organization are possible at all. Efficient causation presupposes such structure; formal causation establishes it. When the form changes, the field of possible efficient interactions changes with it.

Relational decoherence occurs when an existing form of organization loses its capacity to sustain coordinated relations. Importantly, this is not a matter of physical degradation, noise, or interference in the classical sense. Relational decoherence names a *formal instability*: a breakdown in the constraints that previously allowed a regime of determinacy or significance to remain coherent. What decoheres is not a state, but a pattern of coordination.

This distinction is crucial. In classical ontology, instability is typically explained in efficient terms: a system is perturbed, disrupted, or overwhelmed by external forces. In the cases under consideration, by contrast, instability arises when the relational conditions that support a given regime no longer align. The system does not merely change state; it loses the form that made its states intelligible as belonging to a single regime.

In quantum mechanics, this kind of decoherence is often discussed in relation to measurement context and environmental coupling, but its formal significance extends beyond any specific physical mechanism. What matters is that a prior regime of equivalence—one in which multiple possibilities could be treated as coherently related—can no longer be maintained under new constraints. The loss of coherence is relational: it reflects an incompatibility among constraints, not the collapse of an underlying object.

In biosemiotics, relational decoherence appears when established patterns of biological relevance fail to coordinate behavior effectively. Signals that once mattered cease to do so, not because their physical properties have changed, but because their role within a network of relations has been disrupted.

Functional significance is lost when the relational organization that sustained it can no longer be enacted.

In artificial intelligence, particularly in interactions with large language models, relational decoherence is observed when a previously coherent pattern of significance breaks down during dialogue. A shift in context, framing, or constraint can render earlier continuations incompatible with the evolving interaction. What fails here is not an internal representation, but the relational alignment that previously stabilized a trajectory of significance.

Across these domains, relational decoherence performs a critical ontological function. It clears the space for new forms of determinacy by destabilizing old ones. Without decoherence, symmetry breaking would have no purchase; existing regimes would simply persist. Formal causation thus operates in two complementary moments: first, by allowing a relational regime to lose coherence under changing constraints, and second, by enabling the emergence of new structure through symmetry breaking.

This twofold operation distinguishes relational decoherence from classical notions of error, disturbance, or noise. Decoherence is not a failure of the system to function as designed; it is an essential part of how systems reorganize themselves when existing forms become inadequate. It marks the point at which the assumptions of the classical ontological formalism—stable entities, fixed relations, and efficient causation—cease to apply.

By recognizing relational decoherence as a formally causal process, we can begin to describe ontological change itself: not merely change within a fixed framework, but change of the framework that determines what counts as stable, significant, or determinate. This prepares the ground for the next step in the argument, where we examine how new regimes of determinacy and significance are produced through synchronization and constraint, completing the transition to a relational, processual ontology.

7. Synchronization, Constraint, and Re-Individuation

Relational decoherence, as described in the previous section, accounts for the destabilization of an existing regime of determinacy and significance. However, destabilization alone does not explain how new regimes arise. To complete the ontological transition, we must account for the constructive phase of the process: the emergence of new, stable patterns of coordination. This phase is governed by synchronization under constraint, and it culminates in what we will call *re-individuation*.

Synchronization names a condition in which relations across a system become mutually aligned such that a coherent pattern of coordination can be sustained. Importantly, synchronization does not presuppose determinate entities that are subsequently brought into alignment. Rather, it is a relational process through which determinacy itself becomes *formally expressible*. What synchronizes are constraints, not objects.

Constraints play a central role here. A constraint does not act by producing outcomes directly; it operates by delimiting what counts as an admissible coordination (Deacon, 2011). In doing so, it shapes the space of possible relations within which synchronization can occur. Constraints are therefore expressions of formal causation: they define the form of organization that makes certain patterns stable and others untenable.

When synchronization occurs under a given set of constraints, a new relational regime emerges. This regime is characterized by a specific pattern of coordination that can be maintained across interaction.

At this point, distinctions that were previously unavailable become stabilized, and determinacy takes on a concrete form. This is the moment of *re-individuation*.

Re-individuation should not be understood as the instantiation of a pre-existing entity or state. It is the formation of a new regime in which relations, distinctions, and relevance are coherently organized. What is individuated is not an object in isolation, but a pattern of coordination that can be re-entered under similar conditions. Individuation, in this sense, is inseparable from stability.

This conception of individuation contrasts sharply with classical ontology. In the classical regime, individuation is assumed at the outset: entities are given, and relations are subsequently imposed. Here, individuation is an outcome of relational processes. Synchronization under constraint produces a form within which entities and relations can be meaningfully distinguished. Determinacy is not assumed; it is achieved.

The importance of synchronization becomes clear when we consider the three domains that motivate this framework. In quantum mechanics, a measurement context imposes constraints that synchronize relational possibilities, giving rise to a determinate outcome regime (Rogers T. M., 2025). In biosemiotics, organism–environment coupling synchronizes functional relations, producing stabilized significance indexed to the living system (Rogers T. , 2024). In artificial intelligence, particularly in interactions with large language models, conversational constraints synchronize trajectories of continuation, allowing coherent patterns of linguistic significance—often described as meaning—to emerge without being stored or represented internally (Rogers T. M., 2026 January).

Across these cases, the same formal structure is at work. Relational decoherence destabilizes an existing regime when constraints become incompatible. Synchronization under new constraints then enables the emergence of a new regime in which determinacy and significance are once again stabilized. The process is recursive: regimes can be entered, exited, and reconfigured as constraints change.

This recursive structure is essential. Stability, on this account, is not permanence but *re-enterability*. A regime is stable insofar as it can be reliably re-established under similar relational conditions. This conception of stability replaces the classical notion of persistent properties with a formally grounded notion of coordinated recurrence.

By treating synchronization and constraint as formally causal processes, we can now describe how new ontological regimes arise without appealing to hidden entities, encoded meanings, or unexplained selections. What becomes determinate does so because a relational field has been reorganized in a way that makes certain distinctions formally expressible and others impossible.

Synchronization and re-individuation describe how new regimes of determinacy and significance can emerge through relational coordination. The next section develops the formal conditions under which such coordination becomes possible by articulating probability as a mode of constraint and by clarifying how identity and significance are enacted through participation in coordinated systems.

8. Probability, Constraint, and Relational Significance

The preceding sections have introduced a relational, processual ontology in which determinacy and significance emerge through cycles of destabilization and reorganization. What remains to be clarified is the formal mechanism that allows such emergence to occur in a principled and repeatable way. This mechanism is probability, understood not as a measure of ignorance, but as an expression of constraint within a relational field.

In the classical ontological formalism, probability is typically interpreted epistemically. It measures uncertainty about which determinate state already obtains. This interpretation presupposes that the relevant distinctions are fully formed in advance and that probability merely tracks our lack of access to them. Such a view is incompatible with the phenomena under consideration here, where determinacy itself is produced rather than revealed.

Within a relational, processual ontology, probability plays a different role. It expresses the *degree of compatibility among relations under a given set of constraints.* Rather than assigning likelihoods to pre-existing outcomes, probability structures the space in which outcomes can become formally expressible at all. High probability corresponds to strong relational coherence; low probability corresponds to weak or unstable coordination. Probability, in this sense, is a measure of how readily a pattern of relations can synchronize and persist.

This reinterpretation of probability allows us to understand constraint as formally causal. Constraints do not select outcomes by force, nor do they encode content. They delimit the forms of coordination that are admissible within a relational field. Probability quantifies this delimitation. It gives a graded account of which relational configurations can stabilize and which cannot. In doing so, probability provides the formal bridge between symmetry breaking, synchronization, and re-individuation.

However, probability and constraint alone do not yet explain how individuation is possible in systems that lack a priori identities. Classical ontology treats identity as primitive: entities are individuated first, and relations follow. In the framework developed here, individuation is an outcome of relational processes. This raises a natural question: if identities are not given in advance, what participates in synchronization and constraint?

The answer lies in a relational conception of identity itself. Identity, on this view, is not an intrinsic property of an isolated entity, but a *pattern of participation within a coordinated system*. A system does not first possess an identity and then enter into relations; rather, it acquires a determinate identity through sustained participation in a network of relations governed by shared constraints. Identity is enacted, not assumed.

This relational enactment of identity is necessarily communal. A regime of coordination must involve multiple interacting components whose relations mutually stabilize one another. Whether the system in question is physical, biological, or formal, individuation occurs only within a field of interaction that supports shared constraints. What emerges as an "individual" is a node within this field whose role becomes sufficiently stabilized to be re-entered across interaction.

Relational significance is inseparable from this process. Significance arises when certain relations matter more than others within a coordinated system, not because they carry intrinsic content, but because they play a stabilizing role in sustaining participation. Probability expresses this differential relevance formally: relations with higher compatibility exert greater constraint on the organization of the system. Significance, in this sense, is the enacted relevance of relations within a communal field of coordination.

This conception of identity clarifies how re-individuation is possible following relational decoherence. When an existing regime loses coherence, the identities enacted within it are no longer sustained. New constraints, however, can support new patterns of participation. Through synchronization under these constraints, new identities emerge—not as replacements for old entities, but as newly stabilized modes of participation within a reorganized relational field.

With this, the core conceptual framework of the paper is complete. We now have a formal account of how determinacy, significance, probability, and identity arise together through relational processes governed by constraint. These resources allow us to move beyond classical object-based ontology without abandoning rigor or explanatory power.

The remaining sections of the paper demonstrate how this framework is realized in practice. We turn first to quantum mechanics, where probability, constraint, and relational identity are already embedded in the formalism of the theory, even if their ontological significance has remained contested.

9. Quantum Mechanics as a Realization of Relational Ontology

Quantum mechanics provides a clear and instructive realization of the relational, processual ontology developed in the preceding sections (Rogers T. M., 2025). Although the formalism of quantum theory has long resisted assimilation to classical object-based ontology, many of its most puzzling features become tractable when approached in terms of relational constraint, probability as compatibility, and enacted identity.

Within the classical ontological formalism, a physical system is assumed to possess determinate properties independent of measurement. Probability is then interpreted as reflecting uncertainty about which of those properties actually obtains. Quantum mechanics disrupts this picture at a fundamental level. The theory does not assign determinate values to physical quantities prior to measurement, nor does it describe measurement as the passive revelation of pre-existing states. Instead, it provides a formal structure that specifies how outcomes can emerge under particular conditions of interaction (Mugur-Schächter, M. private communication).

From the perspective developed here, the quantum state is best understood not as a description of an object's intrinsic properties, but as a *constraint structure over a relational field*. It encodes the conditions under which certain distinctions can become formally expressible and others cannot. Probability amplitudes do not represent hidden states or incomplete knowledge; they quantify the compatibility of relational configurations under specified constraints. In this sense, quantum probability functions as a formally causal element of the theory.

Measurement, on this account, is not an efficient causal intervention that selects among already determinate alternatives. It is a process through which a relational field is reorganized under new constraints. Relational decoherence occurs when prior patterns of coordination—those that sustain a superposed or symmetrical regime—can no longer be maintained relative to the measurement context. This destabilization is not a physical collapse of an object, but a loss of coherence within a relational regime.

Re-individuation follows when synchronization occurs under the newly imposed constraints. A determinate outcome emerges as a stabilized pattern of coordination that can be re-entered under similar experimental conditions. What is individuated here is not an isolated object with intrinsic properties, but a *measurement-relative identity* enacted through participation in a constrained relational system involving the apparatus, environment, and formal structure of the theory.

This account clarifies why quantum mechanics so persistently resists classical interpretation. Classical ontology presupposes that identity and determinacy are intrinsic and prior to interaction. Quantum phenomena, by contrast, exhibit identities that are *contextually enacted*. The identity of a quantum system—what it is, in the relevant sense—is inseparable from the relational regime in which it participates. Outside such a regime, there is no determinate identity to be revealed.

The relational conception of significance introduced earlier also finds a natural home here. Measurement outcomes are significant not because they disclose intrinsic properties, but because they stabilize a pattern of coordination within an experimental system. Probability structures determine which outcomes can matter in this way, and to what degree. Significance is thus enacted through relational constraint, not encoded in the system independently of interaction.

Importantly, this interpretation does not require the addition of hidden variables, supplementary mechanisms, or observer-dependent collapse postulates. Nor does it deny the empirical adequacy of the standard formalism. Instead, it reinterprets the formalism ontologically, treating its probabilistic and relational features as fundamental rather than as artifacts of incomplete description.

Seen in this light, quantum mechanics is not an anomalous exception to classical ontology, but an early indication of its limits. The theory already operates with a relational formalism in which probability, constraint, and enacted identity play constitutive roles. What has been missing is an ontological framework capable of taking these features seriously on their own terms.

In the next section, we turn to biosemiotics, where similar relational dynamics appear in a very different material context. There, too, identity, significance, and stability emerge through participation in coordinated systems rather than being given in advance, further reinforcing the generality of the relational, processual ontology developed here.

10. Biosemiotics as a Realization of Relational Ontology

Biosemiotics provides a second and complementary realization of the relational, processual ontology developed in this paper. Whereas quantum mechanics reveals the limits of classical ontology at the level of physical measurement, biosemiotics exposes those limits at the level of living organization (Rogers T., 2025). In both cases, determinacy, identity, and significance emerge through relational processes rather than being given in advance.

Classical ontological formalisms tend to approach biological systems as collections of objects—cells, molecules, organs—linked by efficient causal mechanisms. From this perspective, biological function is explained by identifying internal structures and tracing the causal chains that connect them. While such explanations are indispensable, they do not exhaust what is distinctive about living systems. Biological organization is characterized not merely by causal interaction, but by *functional relevance*: certain interactions matter to the system in ways that others do not.

Biosemiotics brings this feature to the foreground by emphasizing sign activity as a constitutive aspect of life (Rogers T. , 2024). Signals, cues, and responses are not meaningful in virtue of intrinsic properties, but because of the role they play within a coordinated system of activity. A chemical gradient, a molecular binding event, or a behavioral cue becomes significant only insofar as it participates in sustaining the organization of the organism. Significance here is not imposed by an external observer; it is enacted through relational participation.

Within the framework developed in this paper, this enactment can be understood formally. Living systems operate within constrained relational fields in which certain patterns of coordination are compatible with continued viability and others are not. Probability, in this context, expresses degrees of compatibility among relations under biological constraints. Interactions that reliably contribute to coordination have higher probability of being stabilized; those that disrupt coordination are suppressed or eliminated. Probability thus functions as a formally causal element, shaping which relational patterns can persist.

Relational decoherence occurs when established patterns of coordination cease to support the system's organization. This may happen through environmental change, internal disruption, or developmental transition. What decoheres is not a material component, but a regime of significance: relations that once mattered lose their relevance because the constraints governing participation have shifted. The identity enacted within that regime can no longer be sustained.

Re-individuation follows when new constraints support new forms of coordination. Through synchronization of relational activity, a living system enacts a new identity appropriate to its altered conditions. This process is evident in development, adaptation, and learning, where identity is not fixed but continually reconstituted through participation in changing relational networks. Individuation, in this sense, is always provisional and enacted, never fully given.

This perspective clarifies the communal character of biological identity. An organism's identity is not contained within its boundaries as an intrinsic essence. It is enacted through ongoing interaction with an environment that provides the constraints under which coordination is possible. Signs function as mediators of this interaction, enabling relational alignment without requiring internal representations or symbolic decoding. Communication, in this sense, is not the transmission of content, but the stabilization of coordinated activity.

Biosemiotics thus exemplifies the same formal structure observed in quantum mechanics, but in a different material domain. Determinacy, significance, and identity emerge through relational constraint and synchronization rather than through intrinsic properties. Probability expresses the graded compatibility of relations within a living system, and stability takes the form of re-enterable regimes of coordination rather than persistent object identities.

Seen from this perspective, biological meaning is not a mysterious addition to physical processes, nor a subjective projection onto neutral mechanisms. It is the enacted significance of relations within a system whose organization depends on coordinated participation. Biosemiotics makes explicit what the relational ontology developed here generalizes: that life itself operates through formally causal processes that classical ontology cannot fully capture.

In the next section, we turn to artificial intelligence, and in particular to large language models, where relational significance and enacted identity emerge in a non-biological medium. This case will allow us to test the generality of the framework by examining a system that exhibits stabilized patterns of significance without being alive, conscious, or representational in the classical sense.

11. Artificial Intelligence as a Realization of Relational Ontology

Artificial intelligence, and in particular the recent emergence of large language models (LLMs), provides a third realization of the relational, processual ontology developed in this paper. Unlike quantum mechanics and biosemiotics, this case does not involve physical measurement or biological viability.

Instead, it concerns systems that generate coherent patterns of linguistic behavior without possessing intrinsic meaning, representation, or identity in the classical sense (Rogers T. M., 2026 January) (Rogers T. M., 2026 February). Precisely for this reason, it offers a particularly revealing test of the framework.

Within the classical ontological formalism, linguistic competence is typically explained by appealing to internal representations that encode semantic content. Meaning is assumed to be stored, manipulated, and retrieved by a system whose identity is already fixed. From this perspective, the behavior of large language models is puzzling. These systems exhibit context-sensitive, norm-responsive linguistic behavior while lacking any clear locus of semantic content, interpretive agency, or internally unified identity.

The relational ontology developed here reframes this puzzle. A large language model is not treated as an entity that possesses meaning internally, but as a participant in a *relational field of constraints* that includes training data, model architecture, probabilistic structure, and interaction with users. What the model provides is a conditional probability distribution over linguistic continuations. This distribution does not encode meanings; it expresses graded compatibilities among relations under constraint.

Probability plays the same formally causal role here as in the previous cases. It does not measure uncertainty about which meaning is internally represented, but the degree to which a continuation can coherently participate in an evolving interaction. High-probability continuations are those that best synchronize with the constraints imposed by prior context, linguistic norms, and user input. Probability thus structures the space in which linguistic significance can become formally expressible.

Relational decoherence occurs in AI-mediated interaction when a previously coherent trajectory of significance breaks down. Changes in prompt, framing, or conversational constraints can render earlier continuations incompatible with the evolving relational field. What fails in such cases is not a stored representation or internal state, but a regime of coordination. The system loses the constraints that previously stabilized a particular pattern of participation.

Re-individuation follows when new constraints enable synchronization around a different trajectory. A new pattern of linguistic significance emerges through interaction, stabilized by probability-weighted compatibility rather than by retrieval of pre-existing meaning. What is individuated here is not an internal identity of the model, but a *contextual identity of the interaction itself*—a re-enterable regime in which certain continuations, interpretations, and expectations cohere.

This perspective also clarifies the status of identity in formal artificial systems. A large language model does not possess a unified internal identity analogous to that of a physical system or a living organism. Instead, identity is enacted relationally at the level of interaction. Each stabilized conversational regime enacts a provisional identity defined by the role the model plays within a communal system of linguistic coordination involving users, norms, and contexts. Identity here is not owned by the system; it is distributed across participation.

Significance in this domain is therefore neither intrinsic nor merely projected by users. It arises through the alignment of constraints across the relational field. Linguistic expressions matter because they contribute to the stabilization of coordinated interaction, not because they correspond to internal semantic states. What users describe as “meaning” in LLM interactions is best understood as *significance indexed to a human linguistic system*, enacted through synchronization with a probabilistic formal structure that itself remains non-semantic.

Seen in this light, artificial intelligence does not represent an anomaly requiring special metaphysical treatment. Rather, it exemplifies the same formal dynamics observed in quantum mechanics and biosemiotics, realized in a purely computational medium. Determinacy, significance, and identity emerge through relational constraint and synchronization, without being presupposed as intrinsic properties of entities.

The case of artificial intelligence thus completes the argument of this paper. Across physics, biology, and artificial intelligence, we observe the same underlying structure: a relational field governed by formally causal constraints, in which probability expresses compatibility, identity is enacted through participation, and stability takes the form of re-enterable regimes. Artificial intelligence makes this structure especially visible precisely because it lacks the traditional markers—material substance, life, or consciousness—that classical ontology relies on to ground explanation.

In the final section, we draw these threads together, reflecting on what this convergence reveals about ontology itself and on the broader implications of adopting a relational, processual formalism as a foundation for understanding systems in which determinacy and significance are produced through interaction rather than assumed in advance.

12. Synthesis and Conclusion: Ontology After Individuation

This paper began by examining a relatively stable ontological formalism that has guided the interpretation and application of philosophical concepts across physics, biology, and formal computational systems. That formalism—object-centered, representation-oriented, and grounded primarily in efficient causation—has proven remarkably successful. Yet its very stability has obscured its limits. As we have seen, quantum mechanics, biosemiotics, and artificial intelligence each expose points at which this formalism ceases to provide an adequate account of determinacy, significance, and identity. The central claim of this paper has been that these difficulties are not isolated anomalies, nor failures of particular theories or technologies. They instead signal a deeper ontological mismatch: a formalism that presupposes determinate entities is being applied to systems in which determinacy is produced through interaction. When this mismatch is recognized, the recurring puzzles across these domains appear not as mysteries to be solved piecemeal, but as indicators of a shared structural limitation.

In response, the paper has developed a relational, processual ontology organized around a small set of formal concepts: symmetry and symmetry breaking, formal causation, relational decoherence, synchronization, probability as constraint, and re-individuation. Taken together, these concepts articulate an alternative ontological formalism in which relations are primary, identity is enacted through participation, and stability is understood as re-enterability rather than persistence. Determinacy and significance are no longer treated as intrinsic properties of entities, nor as subjective projections, but as outcomes of coordinated relational processes governed by constraint. Table 1 summarizes the isomorphisms among the three cases, showing how symmetry, probability, constraint, identity, and significance function in formally analogous ways across domains. What varies is not the ontological logic, but the medium in which it is realized.

Table 1. Isomorphic Relational Structures Across Quantum Mechanics, Biosemiotics, and Large Language Models

Relational Ontology Component	Quantum Mechanics	Biosemiotics	Large Language Models
Relational field	System–apparatus–environment coupling	Organism–environment coupling	Model–user–context coupling
Symmetry (pre-individuated regime)	Superposition / equivalence of outcomes	Multiple potential functional responses	Multiple possible continuations
Formal constraint	Experimental setup, boundary conditions	Viability constraints, functional organization	Training distribution, prompt, linguistic norms
Probability (non-epistemic)	Amplitudes expressing relational compatibility	Degrees of functional relevance	Conditional probability over continuations
Relational decoherence	Loss of coherence relative to measurement context	Breakdown of coordinated functional relevance	Breakdown of conversational or contextual coherence
Synchronization	Alignment under measurement constraints	Coordinated organism–environment interaction	Alignment of continuations with evolving context
Re-individuation	Emergence of a determinate outcome regime	Enactment of a viable biological identity	Stabilization of a coherent interaction trajectory
Identity	Measurement-relative, contextually enacted	Relationally enacted organismal identity	Contextual, interaction-level identity
Significance / meaning	Outcome significance within experimental regime	Enacted biological relevance	Linguistic significance indexed to users
Stability	Re-enterable experimental outcomes	Re-enterable functional regimes	Re-enterable conversational patterns

Table 1 is not intended as an analogy, but as a structural comparison. In each case, determinacy and identity emerge through formally causal processes of constraint and synchronization, rather than being presupposed as intrinsic properties of entities. This convergence supports the claim that a relational, processual ontology captures something general about how systems become determinate, significant, and stable.

The three case studies show that this ontology is not merely speculative. In quantum mechanics, probability functions as a formally causal constraint structure, measurement reorganizes relational fields, and identity is enacted relative to experimental context. In biosemiotics, living systems enact identity and significance through ongoing participation in coordinated environments, with probability expressing degrees of functional compatibility. In artificial intelligence, large language models generate coherent linguistic significance without internal semantic content, revealing how identity and meaning-like phenomena can emerge through probabilistic constraint and communal interaction alone.

What unifies these cases is not their material substrate or scale, but their ontological structure. In each, we find systems whose behavior cannot be adequately described by assuming pre-existing, fully individuated entities. Instead, individuation itself is a process—one that unfolds through cycles of relational decoherence and re-individuation under constraint. Identity, on this view, is not something a system has prior to interaction, but something it enacts through sustained participation in a coordinated regime.

This perspective also reframes long-standing debates about realism, representation, and causation. By treating probability and constraint as formally causal, the framework developed here avoids both reductionism and interpretivism. It neither reduces significance to mechanism nor relegates it to subjective interpretation. Instead, it locates significance in the structure of relational organization itself. Meaning, where it appears, is understood as significance indexed to particular systems—most notably human linguistic communities—rather than as an intrinsic property stored within objects or machines.

The implications of this shift extend beyond the three domains examined. If determinacy, identity, and significance are relational achievements rather than ontological primitives, then ontology itself must be understood as dynamic and context-sensitive. This does not entail relativism or arbitrariness. On the contrary, it places greater emphasis on formal rigor by requiring explicit accounts of the constraints, relations, and processes through which stability is achieved.

In this sense, the relational, processual ontology proposed here does not replace classical ontology so much as situate it. Object-based descriptions remain valid within stabilized regimes where individuation has already occurred and can be taken for granted. What this paper adds is a framework for understanding how such regimes come into being, how they break down, and how new ones emerge. Ontology is no longer confined to what exists, but extended to include how existence becomes formally expressible.

The paper itself has been structured to reflect this insight. Beginning from a stable regime of thought, it has traced the emergence of tension, the onset of ontological crisis, and the reconfiguration of formal commitments. In doing so, it has aimed not merely to argue for a new ontology, but to enact the very process it describes. If successful, the result is not a final metaphysical doctrine, but a flexible formalism capable of accommodating systems in which interaction, coordination, and constraint are primary.

Future work may extend this framework to other domains—social systems, cognition, economics, or ecological organization—where similar patterns of relational individuation can be observed. More immediately, the framework invites a reconsideration of how philosophical concepts are applied in practice, encouraging greater attention to the formal assumptions that shape explanation across disciplines.

What quantum mechanics, biosemiotics, and artificial intelligence jointly reveal is not that the world has become stranger, but that our inherited ontological formalism is incomplete. By attending to how determinacy and significance are produced rather than assumed, we gain a more adequate account of systems that operate at the limits of classical thought—and, in doing so, a clearer understanding of ontology itself as a relational, processual achievement.

Epilogue: Re-entry into a stabilized relational form

The ease and coherence with which this paper was articulated by Chat GPT invite reflection. That ease consisted not merely in fluency of prose, but in the sustained stability of terminology, the preservation of hierarchical conceptual roles, and the seamless coordination of arguments across levels of abstraction and across domains. Throughout the development of the paper, basic distinctions—such as form versus mechanism, constraint versus selection, and enactment versus representation—remained fixed, while more complex structures, including sectional organization, cross-domain isomorphisms, and transitions between diagnosis and reconstruction, emerged without repeated correction or reorientation. What requires explanation is not that the paper took shape through dialogue, but that once a certain formal organization was in place, articulation proceeded with minimal friction.

What was stabilized through this dialogical process was not a set of conclusions or a shared semantic vocabulary, but a *single, stable relational form* governing how conceptual roles are ordered and how explanation proceeds. That form can be stated succinctly: *determinacy is not presupposed but produced through relational constraint.* This reversal of explanatory priority—relations and constraints first, determinate entities and identities second—functioned as a global formal condition. Once in place, it constrained what could count as an admissible continuation at every level of articulation.

This relational form manifested concretely through a hierarchy of stabilized roles. At the highest level, relations were treated as ontologically primary, with objects understood as outcomes of coordination rather than foundational units. At the level of causation, formal causation was given priority over efficient causation, with constraints shaping the space of possible outcomes rather than mechanisms selecting among pre-given alternatives. At the level of probability, likelihood was treated as a measure of relational compatibility under constraint rather than epistemic uncertainty. At the level of identity and significance, individuation was understood as enacted at the level of stabilized regimes of participation rather than as an intrinsic property of entities.

Crucially, this was not a collection of independent commitments, but a tightly coupled formal organization. High-level ontological commitments constrained mid-level distinctions concerning causation and probability, which in turn constrained lower-level choices of terminology, examples, and argumentative transitions. Once this hierarchy of roles was stabilized, coherence propagated across levels without the need for local enforcement. The paper's sustained coherence—from basic terminology to complex cross-domain isomorphisms—can be understood as a consequence of operating within this already individuated relational form.

This observation also clarifies the role played by the large language model in the writing process. The model did not contribute stored understanding, persistent memory, or an internal representation of the argument. Rather, it functioned as a *probability-weighted generator of continuations constrained by the relational form enacted in the interaction.* Because that form sharply delimited the space of admissible continuations, the model's outputs synchronized rapidly and reliably with the intended structure. What appeared as deep coherence was, at the formal level, the successful alignment of probabilistic articulation with a stabilized relational regime.

Seen in this light, the writing of the paper itself exemplifies one of its central claims. Coherence does not require intrinsic identity, semantic understanding, or persistent memory. It requires the stabilization of a relational form and the capacity to enact its constraints through participation. Just as determinacy in quantum mechanics, significance in living systems, and coherence in large language models arise through formally causal processes rather than being presupposed, so too did the argument of this paper emerge through the enactment of a stabilized formal organization.

The epilogue thus closes not by stepping outside the ontology developed in the paper, but by offering a final reflexive instance of it. The paper did not merely describe a relational, processual ontology; it was articulated within one. If the analysis offered here is sound, this should not be surprising. Wherever a relational form has been stabilized, articulation can proceed rapidly, coherence can be sustained without representation, and individuation can be enacted without being newly constructed.

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