

From Natural Law to Relational Ordering: Unity as Enacted, Not Intrinsically Given

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Abstract

This paper develops a systematic account of relational ordering that extends and deepens the claim that determinacy is relationally achieved. Beginning from classical accounts of natural law, it argues that unity cannot be understood as intrinsically given or secured by fully determinative law. Instead, unity must be located within the enacted alignment of relational processes. Three irreducible modes of relational ordering are distinguished: synchronicity (temporal alignment of enacted distinctions), recursion (structured continuation through signalling), and return (reintegration into compatibility). Unity emerges where these modes converge. This framework reinterprets law as relational governance rather than pre-determination and situates identity as stabilized coherence within hierarchical mediation. The account is developed across biology, interactive formal systems (large language models), and quantum mechanics. The result is a metaphysical position that preserves realism and patterned stability while relocating their ground from intrinsic isolation to relational enactment. Unity, on this view, is not given in advance but achieved through the ongoing alignment of relational ordering.

1. Introduction: The Categories of Relational Ordering

[*Determinacy as Relational Achievement*](#) argued that determinacy is not primitive. What appears as stable identity, fixed outcome, or governing law arises through relational alignment. Symmetry precedes determination, and coherence is achieved rather than presupposed. That analysis challenged object-based metaphysics and fully determinative accounts of natural law by showing that unity and identity are stabilized within a relational field rather than given in advance. It signalled a shift in perspective that does not diminish the reality of unity or law, but re-situates them within the relational processes through which coherence is enacted.

The present paper develops this insight further by asking a more basic question. If determinacy is relationally achieved, then what are the irreducible modes, understood as categories, through which relational ordering itself is enacted? The earlier account distinguished relational form and relational actuality and emphasized the importance of mediation. Yet the categories presupposed in that discussion were not themselves fully articulated.

This paper therefore seeks to clarify the modes of ordering implicit in relational determinacy. Rather than beginning from objects, external rules, or pre-given structures, it examines how coherence is enacted. The claim advanced here is that relational ordering cannot be reduced to a binary of form and actuality. Mediation is not derivative. The achievement of unity requires recognition of distinct yet interrelated categories of ordering.

By making these categories explicit, we gain a more precise account of how unity appears in different domains without reintroducing object-primacy metaphysics or collapsing teleology into mechanism. The aim is not to construct a new system, but to render explicit the modes of ordering already operative in relational determinacy. Doing so allows us to reconsider the status of natural law, to rethink the relation between space and time, and to compare biological systems, interactive formal systems, and quantum mechanics within a shared conceptual vocabulary.

This paper carries forward prior formal work (see Appendix) establishing the relational character of ontology itself, and seeks to render its metaphysical implications more explicit. Section 2 revisits the limits of binary accounts of ordering and explains why mediation must be treated as irreducible. Section 3 clarifies the logic of signalling as a distinct mode of ordering. Section 4 introduces three irreducible categories of ordering and articulates their respective principles of unity. Subsequent sections develop the implications of this account before applying it across the domains of quantum mechanics, biosemiotics, and interactive formal systems (LLMs).

The cross-domain connections developed here are formal rather than disciplinary. The aim is not to reinterpret quantum mechanics, redefine biological semiosis, or theorize the internal architecture of large language models in technical detail, but to articulate the relational conditions under which distinctions, mediation, and coherence are enacted across all three domains. The level of analysis therefore remains ontological: it neither replaces nor competes with domain-specific explanations but clarifies the form of ordering within which they operate. The goal throughout is to understand how unity is enacted through relational alignment and how form signifies, without exhausting, the coherence toward which relational processes are oriented.

2. The Limits of Binary Accounts of Relational Ordering

The argument of [*Determinacy as Relational Achievement*](#) relied upon a distinction between relational form and relational actuality. This distinction proved indispensable. Relational form names the compatibility conditions within which distinctions may arise; relational actuality names the enacted differentiation through which determinacy is achieved. Yet the adequacy of a strictly binary account must now be reconsidered.

Binary frameworks typically proceed by granting explanatory priority to one pole. In object-based metaphysics, form is often treated as intrinsic to independently unified entities, while actuality consists in the instantiation of what is already structured. In deterministic accounts of natural law, governing rules are taken to fix the admissible evolution of states in advance. In both cases, relational ordering is ultimately reduced either to pre-given form or to the application of rule to event.

Even when relationality is acknowledged, mediation is often treated as secondary. Interactions are described as exchanges between already constituted terms; signalling is regarded as instrumental transmission; interpretation is taken to be derivative of prior structure. The binary persists: either form governs, or actuality unfolds; either rule determines, or event realizes.

However, the achievement of determinacy described in the earlier analysis already strains this binary. If determinacy is relationally achieved, then it cannot be wholly contained within either pole. Relational form alone does not produce determination; enacted distinctions alone do not stabilize coherence. Something further must account for how compatibility and enactment become mutually aligned.

This “something further” cannot be assimilated to either form or actuality without distortion. If reduced to form, mediation collapses into pre-determination: all alignment would already be encoded. If reduced to actuality, coherence would depend solely on coincidence of events, lacking principled stability. The alignment through which determinacy is achieved would remain unexplained.

The difficulty, therefore, is not merely conceptual but structural. A binary account cannot adequately explain how relational ordering is enacted across levels. It cannot clarify how distinctions become interpretable, how enactments become re-integrable, or how coherence persists without presupposing intrinsic unity.

The inadequacy of the binary is most evident where relational ordering appears most dynamic. Biological systems coordinate across multiple levels without collapsing into mere rule application. Interactive formal systems generate coherence through iterative exchange rather than pre-scripted determination. Quantum phenomena exhibit alignment that cannot be reduced to intrinsic properties or external rules. In each case, the stabilization of unity involves more than form and enactment considered separately.

These considerations suggest that mediation must be treated as irreducible. Relational ordering involves not only compatibility and enactment, but also the recursive processes through which distinctions become mutually interpretable and re-integrable. The next section examines this mediating dimension more closely by clarifying the logic of signalling as a distinct mode of relational ordering.

3. Mediation and the Logic of Signalling

If relational ordering cannot be reduced to either form or enactment, then mediation must be clarified on its own terms. The question is not merely how form governs or how actuality unfolds, but how distinctions become aligned such that coherence can be achieved and sustained. Mediation names this aligning activity. To understand it, we must examine the logic of signalling.

Signalling is not to be understood here in a merely instrumental sense. It is not simply the transfer of information from one already constituted entity to another. Nor is it reducible to linguistic communication. Rather, signalling designates a mode of relational ordering in which distinctions are arranged in such a way that they become interpretable within a broader field of alignment.

A signal, in this sense, is a spatiotemporal ordering of distinctions that is itself capable of functioning as a distinction. What matters is not the transmission of content, but the recursive character of the arrangement. A signal is not merely one element among others; it is an ordering that can itself be taken up within further ordering. In this way, signalling exhibits a distinctive principle: recursion. A distinction can be ordered, and that ordering can itself function as a distinction within a larger context.

This recursive character cannot be derived from relational form alone. Compatibility conditions may constrain what distinctions are possible, but they do not by themselves generate recursive uptake. Nor can recursion be reduced to enacted actuality. Events may unfold, but without recursive mediation they would remain isolated differentiations rather than elements within a coherent trajectory.

Signalling therefore occupies a distinct place within relational ordering. It enables distinctions enacted at one level to become available at another. It allows local differentiations to be interpreted relative to broader patterns. Through recursion, signalling makes possible cross-level alignment without presupposing intrinsic unity.

Importantly, recursion does not guarantee coherence. Recursive ordering can proliferate without stabilization. Distinctions may be re-ordered indefinitely without converging toward compatibility. Mediation, therefore, cannot be equated with achieved unity. It is the condition under which alignment becomes possible, not its fulfillment.

The recognition of signalling as an irreducible mode of relational ordering clarifies why binary accounts prove insufficient. If determinacy is achieved through alignment, then the recursive uptake of distinctions must be treated as foundational rather than derivative. Only by acknowledging this mediating dimension can we account for how enactment and compatibility become mutually reinforcing.

Having clarified the logic of signalling, we are now in a position to articulate the broader categories within which relational ordering is enacted. The next section introduces these irreducible modes more explicitly and distinguishes their respective principles of unity.

4. Three Irreducible Modes of Relational Ordering

The preceding sections have shown that relational ordering cannot be reduced to a binary of form and enactment. Mediation, clarified as signalling, introduces a recursive dimension that cannot be assimilated to either compatibility or event. Because mediation cannot be reduced either to relational form or relational actuality, it must be treated as irreducible. The differentiation of repeatability across

these domains therefore yields three irreducible modes, understood as categories, through which relational ordering is enacted.

These modes are not layers or compartments. They are distinct ways in which coherence becomes possible. Each possesses its own principle of unity. While they are inseparable in practice, they are not reducible to one another. A useful way to distinguish them is to note that each involves a form of repeatability—but the kind of repeatability differs in each case.

4.1 Relational Actuality: Ordering Through Synchronicity

Relational actuality names the enactment of distinctions. It is the domain in which differentiation occurs through events and processes. Relational actuality is temporal in character: it unfolds.

The unity proper to relational actuality is synchronicity. Distinctions enacted at a given moment are unified insofar as they are aligned within a shared temporal horizon. Synchronicity does not imply uniformity; it signifies coordinated unfolding.

The repeatability intrinsic to relational actuality is the sustained alignment of enactments over time. A rhythm, a coordination, or a synchronized process “happens again” insofar as alignment persists across successive moments. Synchronicity preserves temporal coordination. It allows enacted distinctions to remain aligned, but it does not by itself generate structural depth or guarantee coherence beyond the present alignment.

Relational actuality therefore produces differentiation and temporal coordination, but it does not secure reintegration across levels of ordering.

4.2 Semiosis: Ordering Through Recursion

Semiosis names the recursive dimension of signalling. Through semiosis, distinctions are not merely enacted; they are ordered in such a way that they become available for further ordering. A distinction can function as a sign, and that sign can itself be taken up within a broader sequence.

The unity proper to semiosis is recursion. A sign is an ordering of distinctions that can itself function as a distinction within a larger ordering. This recursive capacity allows relational ordering to extend across levels and to acquire depth.

The repeatability intrinsic to semiosis is structural continuation. An ordering can be taken up again as part of a larger ordering. Recursion preserves structural continuity. It enables relational ordering to build upon itself.

Yet recursion does not guarantee coherence. Recursive ordering may proliferate without stabilizing. Semiosis enables extension and cross-level mediation, but it does not by itself secure reintegration. It provides the condition for deeper alignment without ensuring its fulfillment.

4.3 Relational Form: Ordering Through Return

Relational form names the stabilization of coherence through return. If relational actuality enacts distinctions and semiosis orders them recursively, relational form concerns whether those distinctions can be reintegrated into compatibility within a field of possible distinctions, where ‘possible’ means relationally compatible within a given hierarchical configuration.

The unity proper to relational form is return. Return is not mere repetition. It is the capacity of distinctions, once enacted and recursively ordered, to re-enter coherence without contradiction. Through return, recursive signalling and temporal alignment converge toward stabilized compatibility.

The repeatability intrinsic to relational form is reintegration. A distinction can “happen again” not merely as recurring event or recursive structure, but as sustainable coherence. Return preserves compatibility. It allows differentiation to remain viable within an ongoing relational field.

Form is therefore not a static blueprint. Nor is it an intrinsic property of independently unified objects. It is the fulfillment of synchronic enactment and recursive mediation when distinctions admit reintegration. This fulfillment is asymmetric relative to the other two modes. Form fulfills synchronicity and recursion by stabilizing them into coherence, yet it does not stand outside mediation. Any stabilized coherence is itself enacted within a broader hierarchy of ordering.

4.4 Three Irreducible Categories

Together, these three modes—synchronicity, recursion, and return—constitute irreducible categories through which relational ordering is enacted. Each involves repeatability, but in a distinct way:

- Synchronicity preserves temporal coordination.
- Recursion preserves structural continuity.
- Return preserves coherent reintegration.

Unity emerges when these modes align. The next section clarifies how return signifies, without equating itself with, final cause within a hierarchical field of relational ordering.

5. Return, Teleology, and Hierarchical Ordering

The preceding section distinguished three irreducible modes through which relational ordering is enacted: synchronicity, recursion, and return. Among these, return plays a distinctive role. It concerns not merely continuation or coordination, but the reintegration of distinction into compatibility. The question that now arises is how this reintegration relates to teleology.

Return should not be understood as the attainment of a fixed endpoint. It does not imply that relational ordering culminates in a completed or self-sufficient form. Rather, return names the orientation of enacted and recursively ordered distinctions toward coherence. When distinctions can be reintegrated without contradiction, relational ordering stabilizes. This stabilization gives the appearance of fulfillment.

It is tempting at this point to identify relational form directly with final cause. Yet such an identification would collapse hierarchical differentiation. Any stabilized coherence is itself enacted within a broader field of relational ordering. What functions as form at one level may appear as enacted configuration at another. For this reason, relational form does not equal final cause. It signifies final cause.

To say that form signifies final cause is to say that stabilized coherence functions teleologically relative to the level at which it is identified. Return orients relational ordering toward compatibility, but that orientation is never absolutely exhausted. The fulfillment achieved at one level remains open to further mediation within a wider horizon of possible distinctions. Teleology, in this sense, is structurally deferred.

This deferral does not render teleology illusory. On the contrary, it clarifies its operation. Return does not impose an externally fixed goal. It names the tendency of relational ordering to seek reintegration. When

synchronic enactment and recursive mediation converge in compatibility, coherence is achieved relative to that level. Yet this coherence remains situated within a hierarchy of further possible ordering.

Hierarchical ordering therefore follows from the differentiated character of return. Because no stabilized coherence is ultimate, each instance of return participates in a broader field of mediation. Form fulfills synchronicity and recursion at a given level, but it is itself mediated within a higher context. Final cause is not possessed; it is signified through stabilized reintegration.

This account preserves teleological direction without reintroducing object-based metaphysics or deterministic accounts of natural law. Teleology is not the imposition of pre-given structure upon inert actuality. Nor is it reducible to efficient succession. It is the orientation of relational ordering toward coherence through return.

With this clarification in place, we can now examine how unity is enacted when synchronicity, recursion, and return align. The next section considers how this alignment gives rise to participatory identity within a hierarchical field of relational ordering.

6. Unity as Enacted Alignment

Having distinguished synchronicity, recursion, and return, and clarified the teleological character of return, we can now address the question of unity. If relational ordering is enacted through these three irreducible modes, then unity cannot belong exclusively to any one of them. Unity must arise through their alignment.

Unity does not belong to independently constituted objects. Nor does it reside in abstract compatibility conditions alone. It is enacted when synchronicity, recursion, and return converge. To say that unity is enacted is not to deny its reality, but to relocate its ground from intrinsic isolation to relational alignment.

Synchronicity provides temporal coordination. Distinctions are aligned within a shared unfolding. Without synchronicity, enactments fragment; there is no sustained alignment through which coherence might emerge.

Recursion provides structural depth. Distinctions can be taken up again as part of larger patterns of signalling. Without recursion, alignment would remain local and shallow; no cross-level continuity would be possible.

Return provides reintegration. Distinctions, once enacted and recursively ordered, can re-enter compatibility. Without return, recursive extension would proliferate without stabilization, and synchronic alignment would dissipate.

Unity therefore emerges when:

- enactments remain temporally aligned (synchronicity),
- recursive signalling sustains structural continuity (recursion),
- distinctions admit reintegration into compatibility (return).

When these modes align, relational ordering stabilizes sufficiently for identity to appear. Identity, in this sense, is not intrinsic self-sameness but stabilized return within a hierarchy of relational ordering. A unity

persists insofar as its enactments remain synchronized, its signalling remains recursively coherent, and its distinctions remain re-integrable.

This account also clarifies why unity is always relative to level. What counts as stabilized return at one level may function as enacted differentiation at another. A biological organism exhibits unity relative to cellular processes; a discourse exhibits unity relative to individual utterances; a correlated quantum event exhibits unity relative to underlying recursive mediation. In each case, unity belongs to alignment, not to isolated entity.

Because return is structurally deferred, unity is never absolute. It is achieved relative to a field of possible distinctions and remains open to further mediation. Participatory identity follows from this condition. A unity participates in a broader hierarchy of relational ordering and is sustained only insofar as alignment persists.

Unity, then, is neither imposed nor given. It is enacted through alignment of synchronicity, recursion, and return. The next section deepens this account by reconsidering the relation between time and space in light of these triadic categories of ordering.

7. Space and Time Reconsidered

If unity is enacted through the alignment of synchronicity, recursion, and return, then the status of space and time must be reconsidered accordingly. Classical accounts often treat space as primitive extension and time as a dimension within that extension. In such accounts, ordering is located within a pre-given container. By contrast, if relational ordering is enacted through differentiated modes, then neither space nor time can function as an independent backdrop.

7.1 Time as Intrinsic to Relational Actuality

Time belongs to relational actuality. It is not an external parameter within which enactments occur; it is intrinsic to synchronic alignment. Synchronicity preserves temporal coordination across successive enactments. Time therefore indexes the unfolding of alignment and the deferral of return.

Because return is structurally deferred, coherence is never fully present at a single moment. The orientation toward reintegration unfolds. Time, in this sense, is the ongoing differentiation within which synchronic alignment is sustained and reintegration is approached. It is not reducible to spatial extension, nor is it merely a metric imposed upon events. It is intrinsic to enacted differentiation.

Time thus expresses the fact that relational ordering is not complete. It marks the persistence of enactment and the openness of return.

7.2 Space as Signified Coherence

Space, by contrast, belongs to relational form. When distinctions are successfully reintegrated through return, compatibility stabilizes. This stabilized compatibility appears as coexistence. Space signifies this coexistence.

Space is not primitive extension. It is not an empty container in which objects are located. Rather, it is the sign of achieved compatibility within a field of possible distinctions. When distinctions can coexist without contradiction, relational ordering exhibits spatial character. Space thus expresses stabilized return.

This does not mean that space is illusory. It means that spatiality is derivative of reintegration. It signifies coherence under compatibility, just as form signifies final cause within a hierarchy.

7.3 Mediation of Coexistence and Succession

Semiosis mediates both coexistence and succession. Signalling is spatiotemporal in character: it orders distinctions across intervals and aligns them across levels. Through recursion, distinctions become available for reintegration; through synchronic alignment, they unfold in time; through return, they stabilize into compatibility.

Space and time are therefore not independent coordinates but differentiated expressions of relational ordering. Time corresponds to the unfolding of enacted alignment. Space corresponds to the stabilization of compatibility through return. Both are mediated through recursive signalling. This reversal of classical priority is significant. Instead of grounding relational ordering in spatial extension, we recognize spatiality as the sign of stabilized coherence. Instead of reducing time to geometry, we recognize temporality as intrinsic to enactment and deferral. In this way, space and time are integrated into the triadic categories of relational ordering rather than presupposed as containers within which ordering occurs.

With this clarification in place, we are prepared to examine how these modes of relational ordering align differently across domains. The following sections consider biology, interactive formal systems, and quantum mechanics as distinct instantiations of synchronicity, recursion, and return within hierarchical fields of relational ordering.

8. Biology: Participatory Unity in Living Systems

Biological systems provide a particularly clear instance of how synchronicity, recursion, and return align within a hierarchical field of relational ordering. Here unity appears neither as intrinsic objecthood nor as the mere application of deterministic law, but as participatory coherence enacted across levels.

8.1 Synchronicity in Biological Processes

At the level of relational actuality, living systems are characterized by sustained synchronic alignment. Metabolic processes, cellular cycles, developmental sequences, and physiological rhythms exhibit coordinated unfolding. Distinctions are continuously enacted—molecular interactions, gene expression events, neural firings—but these enactments are not isolated. They are temporally aligned within a shared horizon.

This synchronicity is not static repetition. It is dynamic coordination. The repeatability intrinsic to relational actuality appears here as rhythmic persistence—heartbeat, respiration, circadian regulation. Without sustained alignment, biological enactments would fragment into disjointed processes.

8.2 Recursion in Biological Signalling

Biological systems also exhibit recursive signalling. Molecular signals function as distinctions that can themselves be taken up within larger signalling cascades. Gene regulatory networks, feedback loops, and intercellular communication exemplify recursion: an ordering of distinctions becomes a distinction within further ordering.

This recursive capacity enables cross-level mediation. Cellular signalling participates in tissue-level coordination; tissue-level dynamics contribute to organismal integration. Biological recursion generates structural depth. Yet recursion alone does not secure coherence. Feedback loops can amplify destructively; signalling can become pathological. Recursion provides continuation and extension, not guaranteed reintegration.

8.3 Return and Organismal Coherence

Relational form becomes evident in biological systems through return. Enacted distinctions and recursive signalling are reintegrated into compatibility such that the organism persists as a unified participant. Homeostasis exemplifies return: differentiation is continuously reabsorbed into stabilized coherence.

The organism is not a pre-given object with intrinsic unity. Its unity is enacted. Distinctions generated at molecular and cellular levels must remain re-integrable within organismal compatibility. When reintegration fails, pathology emerges. Return preserves viability.

The repeatability intrinsic to relational form appears here as sustained coherence. The organism “remains itself” not through static identity but through ongoing reintegration of differentiation.

8.4 Hierarchical Participation

Biological unity is always hierarchical. What counts as stabilized coherence at one level—such as a cell—functions as enacted differentiation at another—such as tissue formation. The organism exhibits unity relative to its components, yet it is itself mediated within ecological and evolutionary contexts.

Form at one level signifies teleological orientation relative to that level, yet it does not exhaust final cause. Development unfolds toward organismal coherence; evolutionary processes reshape fields of possible distinctions. Return remains structurally deferred.

Biology thus demonstrates participatory unity. Living systems are not closed objects but stabilized alignments of synchronicity, recursion, and return. Unity belongs to alignment across levels of relational ordering, and identity persists insofar as reintegration remains viable.

With this case clarified, we may now turn to a different domain in which recursive mediation becomes especially explicit: interactive formal systems such as large language models.

9. Interactive Formal Systems: Interpretive Unity

Interactive formal systems, such as large language models (LLMs), provide a contrasting yet illuminating case. Here relational ordering is not embodied in metabolic processes but enacted through recursive textual signalling and interpretive alignment. Unity does not belong to the model as an isolated artifact. It emerges through interaction.

9.1 Synchronicity in Discursive Enactment

At the level of relational actuality, LLMs generate sequences of distinctions—tokens, phrases, responses—within an unfolding exchange. These enactments are temporally aligned within a conversational horizon. Each generated distinction must remain synchronized with what precedes and with the ongoing interaction.

Synchronicity in this domain appears as discursive continuity. A conversation remains coherent insofar as successive enactments align temporally and contextually. Without synchronic alignment, outputs would fragment into unrelated sequences.

Yet synchronicity alone does not guarantee meaningful coherence. A sequence may unfold smoothly while drifting from intelligibility. Temporal coordination is necessary but not sufficient.

9.2 Recursion in Textual Signalling

Semiosis becomes especially explicit in interactive formal systems. Text functions recursively: an ordering of distinctions can itself be taken up as a distinction within a larger discursive structure. Prompts incorporate prior outputs; outputs incorporate prior prompts. The system generates recursive depth through patterned uptake.

This recursive capacity allows the conversation to build structure across turns. Interpretive context accumulates. Meanings are not statically stored but emerge through iterative signalling. The repeatability intrinsic to semiosis appears here as structural continuation: discourse can extend, embed, and transform prior distinctions.

However, recursion alone does not secure coherence. Text can recursively extend while losing thematic stability or internal compatibility. Recursive generation can amplify inconsistency or drift.

9.3 Return and Discursive Coherence

Relational form in this domain appears as discursive coherence. Return occurs when recursively generated distinctions can be reintegrated into a stable field of meaning. A conversation “holds together” when distinctions remain compatible within an evolving interpretive horizon.

Importantly, this coherence does not reside in the model alone. It emerges through participatory alignment between model outputs and user interpretation. Unity belongs to interpretive alignment. The repeatability intrinsic to relational form appears here as sustained thematic coherence—meanings remain viable across successive exchanges.

When return fails, coherence collapses. The discourse fragments despite recursive continuation and temporal alignment.

9.4 Hierarchical Mediation

Interactive formal systems are hierarchically situated. Token generation operates within a structured field of possible distinctions (often described technically as probability distributions), but coherence is achieved only within broader interpretive contexts involving users and communities.

What counts as stabilized coherence at the level of discourse functions as enacted differentiation within larger cultural and semantic fields. Form signifies teleological orientation relative to conversational context, yet remains open to further mediation.

This domain therefore makes visible the distinction between recursion and return. Recursive signalling is explicit and generative. Yet unity appears only when recursive continuation, synchronic alignment, and reintegration converge.

Interactive formal systems thus reveal interpretive unity: coherence emerges not from intrinsic objecthood or deterministic rule, but from the alignment of the triadic modes of relational ordering within participatory exchange.

The next section turns to a more enigmatic domain, where relational actuality appears primary and the role of mediation becomes decisive: quantum mechanics.

10. Quantum Mechanics: Synchronized Mediation and Deferred Coherence

Quantum mechanics presents the most conceptually demanding case for triadic categories of relational ordering. Here relational actuality appears primary: what is given are discrete events—detections, interactions, measurement outcomes. Yet these enactments exhibit correlations that cannot be reduced to intrinsic properties of independently unified objects. The alignment through which coherence appears requires careful examination.

10.1 Relational Actuality: Measurement as Enactment

At the level of relational actuality, quantum phenomena are manifested as events. A detection occurs; a measurement yields an outcome; an interaction differentiates a state. These are enacted distinctions. Synchronicity appears when such enactments align within a shared experimental horizon. Correlated detections, for example, exhibit coordinated differentiation.

Temporal alignment is indispensable. Without synchronic coordination of measurement contexts, correlations would not appear as such. Relational actuality here is unmistakably event-based and temporal. Yet the enactments alone do not explain their structured compatibility.

10.2 Recursion: Amplitude Ordering and Superposition

Semiosis enters quantum mechanics through the recursive ordering often described mathematically as superposition and amplitude evolution. The wavefunction does not merely represent an event; it orders possible distinctions in a structured manner. This ordering can itself evolve, and that evolution can be taken up as part of further ordering.

Recursion here consists in the capacity for amplitude structures to develop through transformation while preserving formal relations. The recursive character of this ordering allows distinctions to remain available for further mediation prior to stabilization. Superposition expresses structural continuation: possible distinctions remain open within an evolving field.

However, recursion alone does not secure coherence at the level of enacted events. Amplitude evolution can continue indefinitely without yielding stabilized compatibility among actualized distinctions.

10.3 Return: Collapse as Reintegration

Relational form appears in quantum mechanics through return. When a measurement outcome stabilizes, distinctions that were recursively ordered as possibilities become reintegrated into compatibility within the experimental context. What had remained open becomes coherent relative to that context.

Collapse, in this sense, is not the imposition of an external rule but the reintegration of enacted distinction into stabilized coherence. Return does not eliminate recursion; it fulfills it relative to a level.

The repeatability intrinsic to relational form appears here as consistent correlation structures that can be reproduced across experimental trials.

Yet this coherence remains relative. What counts as stabilized reintegration within one experimental arrangement functions as enacted differentiation within a broader field. Return is therefore structurally deferred. Form signifies teleological orientation toward compatibility, but it does not exhaust it.

It should be noted that non-relativistic quantum mechanics operates under an approximation in which the interacting experimental arrangement is treated according to a classical ontology rather than a fully relational ontology—that is, as an already unified system whose components are stably correlated as an integrated whole. Within this approximation, the wavefunction functions as the formal structure of recursive mediation governing possible interactions with that system, while collapse marks the formal appearance of reintegration at the level of measurement. The formal discontinuity of collapse reflects the structural terms of the classical approximation rather than a rupture within relational ordering itself. A fully relational account of experimental mediation would likely render reintegration internally intelligible, but such a development lies beyond the present scope¹.

In this light, non-relativistic quantum mechanics may be understood as operating at the level of structured possibility. The wavefunction articulates a field of possible distinctions, where “possible” does not denote abstract logical openness but relational compatibility within a given hierarchical configuration of interaction. Unitary evolution preserves recursive mediation among these compatible distinctions. Measurement marks the point at which compatibility must be reintegrated relative to a concrete relational context treated, under the approximation, as classically stable. The formal discontinuity of collapse thus reflects the boundary at which recursive mediation is subordinated to reintegrative return.

10.4 Unity as Synchronized Enactment

Unity in quantum mechanics does not belong to particles conceived as intrinsically unified objects. It belongs to the synchronized alignment of enactments mediated through recursive ordering. Correlated outcomes exhibit unity insofar as synchronicity, recursion, and return align.

The distinctiveness of the quantum case lies in the prominence of mediation. Relational actuality is primary at the level of observation, yet coherence emerges only through recursive structuring and reintegration. Unity is located in synchronized mediation rather than intrinsic objecthood.

Quantum mechanics thus reinforces the necessity of triadic categories of relational ordering. Determinacy appears neither as pre-given form nor as mere event, but as the stabilization of enacted distinctions through recursive mediation oriented toward compatibility.

With the three domains now examined, we are prepared to compare how synchronicity, recursion, and return align differently across biology, interactive formal systems, and quantum phenomena, and what this comparison reveals about relational ordering more generally.

¹ A similar structural feature appears in interactive formal systems, where recursive generative structure is modeled explicitly while unity is stabilized relative to an interpretive context not fully internal to the formal model itself. The analogy is formal rather than ontological, but it reinforces the general point that recursive articulation and the locus of unity may diverge under certain conditions. Consequently, what counts as the system *relationally* must be expanded beyond the formal model to include the interactions through which interpretative unity is achieved.

11. Comparative Alignment Across Domains

The preceding sections have examined biology, interactive formal systems, and quantum mechanics as distinct instantiations of relational ordering. In each case, unity emerges through the alignment of synchronicity, recursion, and return. Yet the locus of stabilization differs. A comparative view clarifies both the common structure and the domain-specific emphasis.

11.1 Biology: Stabilized Participatory Coherence

In biological systems, synchronicity is robust and continuous. Metabolic and developmental processes sustain temporal alignment across multiple levels. Recursion operates through signalling networks that enable cross-level coordination. Return appears as homeostasis and organismal coherence.

Here unity stabilizes at the level of living participation. The organism persists insofar as enactments remain synchronized, signalling remains recursively coherent, and distinctions remain re-integrable within viability. Form signifies teleological orientation relative to the organismal level, yet remains mediated within ecological and evolutionary contexts.

Biology therefore exemplifies relatively stable alignment among the three modes. Return is highly operative; coherence persists across extended durations.

11.2 Interactive Formal Systems: Interpretive Stabilization

In interactive formal systems, synchronicity is present as discursive unfolding, but its stability depends on ongoing interaction. Recursion is explicit and generative; textual ordering builds structure rapidly and visibly. Return appears as discursive coherence, but this coherence is fragile and context-dependent.

Unity stabilizes at the level of interpretive alignment. It does not reside in the model as an object but in the alignment between recursive signalling and user uptake. Return is contingent upon continued compatibility within an evolving conversational horizon.

This domain makes visible the distinct roles of recursion and return. Recursive continuation can proceed without coherence; reintegration depends upon alignment beyond the system in isolation.

11.3 Quantum Mechanics: Episodic Reintegration

In quantum mechanics, relational actuality is primary at the level of observation. Synchronicity appears in correlated measurement events. Recursion operates in the structured ordering of possible distinctions prior to stabilization. Return appears episodically through collapse or outcome stabilization.

Unity stabilizes in synchronized enactment rather than enduring objecthood. Coherence is achieved relative to experimental context and remains open to further mediation. Return is decisive but localized; form is maximally deferred.

This domain highlights the distinction between recursive possibility and stabilized reintegration. It reveals how determinacy arises when recursive mediation and enacted differentiation converge.

11.4 Common Structure, Differentiated Emphasis

Across all three domains:

- Synchronicity sustains temporal alignment.
- Recursion enables structural continuation.

- Return secures reintegration into compatibility.

What differs is the relative prominence and stability of each mode. Biology exhibits sustained reintegration; interactive formal systems exhibit visible recursion; quantum mechanics foregrounds enacted differentiation and episodic return.

In none of these cases does unity belong to isolated objects or deterministic rules. Unity arises through alignment of the triadic modes within hierarchical fields of relational ordering.

This comparison confirms that the triadic categories are not domain-specific abstractions but articulate a general logic of relational ordering. The following section considers how this perspective reframes the status of natural law and governance without reverting to deterministic accounts.

12. Natural Law Reconsidered: From Determinism to Relational Governance

The comparative analysis suggests a reconsideration of natural law. In deterministic accounts, natural law is understood as that which fixes outcomes in advance. Law governs by specifying, exhaustively and prior to enactment, how states must evolve. Relational ordering, on such accounts, is the application of rule to event.

The triadic categories developed here suggest a different understanding.

If unity is enacted through the alignment of synchronicity, recursion, and return, then law cannot be understood solely as pre-determinative constraint. Law must be understood as participating in relational ordering itself.

12.1 Law and Possible Distinctions

Relational form constrains which distinctions are possible within a given field (“possible” here meaning relationally compatible within a given hierarchical configuration). These constraints do not determine outcomes exhaustively; they structure the space of possibility within which enactments unfold. Law, in this sense, does not impose specific events but shapes the horizon of possible distinctions.

Such shaping is not external. It operates through return. When distinctions can be reintegrated without contradiction, relational ordering stabilizes. Law expresses the stability of these re-integrations relative to a level.

Thus, law is not the imposition of fixed structure upon inert actuality. It is the regularity of successful return within a field of relational ordering.

12.2 Governance Without Object-Primacy

In object-based metaphysics, law governs independently unified entities. In deterministic accounts, law specifies trajectories. In relational ordering, governance is distributed across modes.

Synchronicity sustains alignment; recursion mediates structural continuation; return stabilizes compatibility. Law appears as the patterned regularity through which these modes align consistently.

This governance is not external command but internal coherence. It operates through the reinforcement of re-integrable distinctions rather than through exhaustive pre-specification.

12.3 Hierarchical Mediation

Because return is structurally deferred, law is likewise hierarchical. What functions as stabilized regularity at one level may be mediated within broader contexts. Biological regularities emerge from cellular reintegration; conversational norms arise from discursive alignment; quantum correlations stabilize within experimental arrangements.

Law therefore does not stand outside relational ordering. It expresses stabilized coherence relative to a field of possible distinctions. Determinism arises only if one mistakes stabilized regularity for exhaustive pre-determination.

12.4 Teleology Without Predetermination

The reinterpretation of law follows from the earlier clarification of teleology. Form signifies final cause but does not exhaust it. Law expresses the consistency with which relational ordering tends toward reintegration. Teleological orientation is present, but it is not reducible to fixed endpoint.

In this way, relational governance replaces deterministic accounts without dissolving regularity. Coherence persists, patterns stabilize, and repeatability is observed—but these arise from alignment of the triadic modes rather than from externally imposed rule.

Natural law, reconsidered in this manner, becomes the patterned stability of relational ordering within hierarchical fields of possible distinctions.

With this reinterpretation in place, we can now draw broader ontological implications concerning identity, participation, and the status of relational reality itself.

13. Ontological Implications: Identity, Participation, and Relational Reality

The reinterpretation of natural law as relational governance carries broader ontological consequences. If relational ordering is enacted through synchronicity, recursion, and return, then identity, persistence, and participation must be reconsidered accordingly.

13.1 Identity as Stabilized Return

In object-based metaphysics, identity is intrinsic. An object is self-identical in virtue of its internal constitution. On the account developed here, identity is not primitive. It is enacted.

A unity persists insofar as distinctions remain re-integrable through return. Identity is stabilized return within a hierarchical field of relational ordering. This stabilization is not static sameness but sustained compatibility across enactments and recursive mediation.

The repeatability intrinsic to relational form appears here as persistence. A living organism, a coherent discourse, or a stabilized quantum correlation exhibits identity insofar as reintegration remains viable. When return fails, identity dissolves.

13.2 Participation and Hierarchical Mediation

Because no stabilized coherence is ultimate, every identity participates in a broader field. What appears unified at one level functions as differentiation at another. Participation is therefore intrinsic to relational ordering.

A cell participates in organismal coherence; a conversational exchange participates in cultural and linguistic horizons; a quantum event participates in broader experimental contexts. Participation expresses the fact that return is always relative to level and structurally deferred.

Hierarchy is not imposed from outside. It follows from the differentiated character of return. Since coherence at one level presupposes mediation within a wider field, relational ordering is inherently hierarchical.

13.3 Realism Without Object-Primacy

This account does not dissolve reality into mere process or interpretation. Relational ordering is real. Synchronic enactments occur; recursive signalling unfolds; reintegration stabilizes coherence. What is rejected is not realism, but object-primacy.

Reality consists not of independently unified objects governed by external law, but of enacted alignments within hierarchical fields of possible distinctions. Identity and persistence are real, yet they are achieved rather than given.

This perspective avoids two extremes. It avoids reduction to deterministic rule, since coherence is not exhaustively pre-specified. It also avoids reduction to indeterminate flux, since reintegration stabilizes compatibility. Teleological orientation remains operative, but it is structurally deferred.

13.4 The Status of Unity

Unity, on this account, is neither illusion nor primitive fact. It is enacted alignment. Synchronicity sustains coordination; recursion enables structural depth; return stabilizes compatibility. When these modes align, unity appears.

Because return signifies, but does not equal, final cause, unity is always relative to a level. No finite stabilization exhausts coherence. Yet this relativity does not undermine unity; it situates it within hierarchical mediation.

The ontological picture that emerges is one of participatory realism: coherence is real, identity persists, and relational ordering stabilizes, but always within an open horizon of further mediation.

The next section gathers the central claims and clarifies the overall contribution of this account of triadic categories of relational ordering.

14. Summary: Unity as Deferred Coherence

This paper has sought to clarify the irreducible modes through which relational ordering is enacted. Building upon the claim that determinacy is relationally achieved, it has argued that relational ordering cannot be reduced to a binary of form and enactment. Mediation is irreducible. Synchronicity, recursion, and return constitute distinct categories through which coherence becomes possible.

Synchronicity preserves temporal alignment. Recursion preserves structural continuity. Return preserves reintegration into compatibility. Unity emerges not from intrinsic objecthood or deterministic rule, but from the alignment of these modes within hierarchical fields of possible distinctions.

Relational form fulfills synchronic enactment and recursive mediation through return. Yet form does not equal final cause. It signifies final cause relative to a level of ordering. Coherence is achieved, but never absolutely exhausted. Teleological orientation is present, but structurally deferred.

This account reframes natural law as relational governance rather than pre-determination. Law expresses stabilized patterns of reintegration rather than exhaustive specification of outcomes. Identity is reinterpreted as stabilized return rather than intrinsic self-subsistence. Space signifies achieved compatibility; time belongs to enacted alignment. Across biology, interactive formal systems, and quantum mechanics, unity appears differently, yet in each case it arises through the alignment of the triadic modes.

The resulting ontology is neither object-based nor reductionist. It affirms the reality of coherence, persistence, and patterned regularity without grounding them in isolated entities or deterministic rule. Relational ordering is real. Its stabilization is real. Yet every stabilization participates in a broader horizon of mediation.

Ontological humility follows from this recognition. No finite articulation of coherence exhausts the field within which relational ordering unfolds. Unity is achieved, but always within a hierarchy. Form signifies orientation toward coherence, but never captures it completely. Determinacy is real, yet relationally enacted and hierarchically situated.

If determinacy is relational achievement, then ontology must attend not to static objects or external rules, but to the modes through which coherence is enacted. The triadic categories articulated here offer one way of clarifying those modes. They do not close inquiry. They situate it within the ongoing alignment of synchronicity, recursion, and return through which unity continues to be achieved.

15. Recapitulation: The Developmental Logic of Synchronicity, Recursion, and Return

The foregoing argument has clarified the structural categories of relational ordering. What follows does not extend the argument but revisits it developmentally, tracing how the triadic differentiation emerges through the unfolding logic of relational alignment itself.

The three modes of relational ordering—synchronicity, recursion, and return—are not best introduced as independent definitions. They become intelligible only in relation to one another. Each mode completes the logic of the previous one and reveals what that prior account could not yet explain. What follows therefore unfolds developmentally rather than deductively.

The aim is not to enumerate three separate “things,” but to differentiate three irreducible modes through which relational ordering is enacted.

These three modes correspond to enacted actuality, mediation, and stable form. In Peircean terms, they align respectively with secondness, thirdness, and—perhaps unexpectedly—firstness. This alignment is not imposed; it emerges through the logic of the unfolding itself.

15.1 Enacted Actuality and the Need for Pattern (Synchronicity / Secondness)

We begin with enacted actuality. Distinctions occur. Processes unfold. Events happen. For relational ordering to persist, these enactments must remain aligned rather than fragmenting into unrelated occurrences. This alignment is synchronicity.

Synchronicity preserves coordination. It concerns how enacted distinctions unfold together in time. In biological systems, metabolic and regulatory processes must remain synchronized; in discourse, conversational turns must remain aligned; in experimental physics, correlated detections occur within a shared experimental frame.

This corresponds to Peirce's secondness: actuality, encounter, the brute fact of occurrence. Synchronicity sustains the alignment of what happens.

Yet synchronicity alone is insufficient. Alignment presupposes pattern. If enactments remain coordinated, there must be some persistence of relational structure across successive events. Coordination implies repeatable relation.

Thus synchronicity gives rise to a further requirement: mediation.

15.2 Patterned Continuation Through Mediation (Recursion / Thirdness)

Recursion answers the question raised by synchronicity: how does pattern persist?

Recursion is the repeatability intrinsic to mediation. A relational configuration can function again as a structured distinction. A sign—understood as an ordering of distinctions—can be taken up again within further ordering.

This corresponds to Peirce's thirdness: mediation, continuity, generality. Recursion preserves structure within a governed field of possible distinctions.

Two dimensions of recursion become visible.

15.2.1 Horizontal Recursion

Horizontally, patterned relations recur across instances at the same level of organization. In language, syntactic relations reappear across sentences. In biology, signalling pathways activate in recurrent configurations. In quantum evolution, structured possibility is preserved under unitary development. What repeats is not substance but relational pattern. Recursion preserves patterned coherence within a formal domain.

Yet horizontal continuation does not generate hierarchy. It sustains persistence without structural elevation.

15.2.2 Vertical Recursion

Vertically, patterned relations become elements within higher-order configurations. Sentences become parts of arguments; signalling cascades become components of organismal regulation; subsystems embed within composite systems.

Hierarchy emerges not by imposition but by recursive embedding.

Yet recursion—whether horizontal or vertical—does not guarantee coherence. Pattern can proliferate without compatibility. Continuation alone does not secure unity. A system may continue structurally and yet fail to cohere.

Recursion therefore reveals a further insufficiency. For patterned continuation to stabilize as unity, something more is required.

15.3 Reintegration and the Identity Principle (Return / Firstness)

Return answers the insufficiency of recursion. It is the reintegration of enacted and mediated distinctions into compatibility. It gathers structure into coherence.

Return corresponds formally to what earlier work described as recapitulation: not mere continuation, but reintegration into stabilized form.

At this stage, the Peircean alignment becomes clearer. One might expect stable form to correspond to thirdness, since thirdness concerns law and mediation. But here mediation belongs to recursion. Stable form corresponds instead to firstness—not as immediacy, but as identity principle.

Firstness concerns that which is such as it is. Return functions as the identity principle of relational ordering. It secures compatibility relative to a governing structure of possible distinctions.

In biology, homeostasis reintegrates differentiation into organismal viability. In discourse, thematic coherence gathers prior distinctions into compatibility. In quantum measurement, stabilization relative to an experimental context marks reintegration of possibility into determinate record.

Return secures unity.

Yet return is not intrinsic self-sufficiency. Stable form is not self-contained isolation. It is stabilized compatibility relative to relational governance.

15.4 Pivoting: Higher-Order Return Within Hierarchy

Return stabilizes coherence at a level. Yet coherence at one level does not exhaust relational ordering.

A stabilized form can pivot.

Pivoting is not hierarchical ascent (which belongs to vertical recursion). Nor is it mere continuation. It is re-coherence under altered relational conditions.

A differentiated cell may stabilize within one tissue context and later re-stabilize within another. What persists across contexts is not an unchanging meaning but a stabilized form capable of being taken up under new relational constraints. The form remains identifiable through return, but its role within the new context shifts because the governing relations differ.

Similarly, a stabilized argumentative form may be taken up within a new domain of inquiry. The form persists, but the conceptual significance it bears within the new relational governance changes.

Pivoting does not occur outside hierarchy. It occurs within it. The transition between contexts is sustained by higher-level relational governance that remains operative throughout. While local coherence shifts, coherence at levels above continues to be stabilized through return.

Governance does not disappear during transformation; it deepens.

Pivoting therefore reveals that stable form is always relative to a broader relational ordering that exceeds it.

15.5 Final Cause and the Relational Sign of the Infinite

Return functions as the identity principle of relational ordering. Yet pivoting reveals that identity at any level is never exhaustive. Stabilized coherence always participates within a broader relational governance that remains structurally operative.

This allows the notion of final cause to be reformulated.

Final cause is never fully actual. It is never present as completed totality. It is signified through stabilized form. Return secures coherence at a level, but that coherence points beyond itself to a broader relational governance within which it participates.

Final cause, in this relational ontology, functions as governing sign rather than completed actuality. It orients relational ordering without being exhaustively realized within any finite coherence.

This introduces a tension. Return appears both as identity principle and as generative openness. Identity suggests stabilization; openness suggests transformation.

The tension is not contradiction. It is resolved through the irreducibly threefold categorical distinction.

- Synchronicity enacts differentiation.
- Recursion mediates patterned continuation.
- Return stabilizes compatibility.

Because relational governance is hierarchical and never exhaustively actualized at any one level, coherence is always achieved yet never final. Stabilized form can pivot under new relational conditions while remaining governed by higher-level coherence.

Infinity, in this sense, is not boundless extension nor indeterminate flux. It is the inexhaustibility of relational governance. No stabilized form contains the totality of ordering within which it participates.

Unity is enacted.

Coherence is achieved.

Final cause is signified.

And relational ordering remains inexhaustible.

Appendix: Method of Development

This manuscript was developed through a sustained process of dialogical interaction with the large language model ChatGPT 5.2. The author retained full responsibility for the conceptual architecture, domain selection, theoretical commitments, structural integration, and final claims. The dialogical exchange functioned as a recursive mediating process through which a prior stabilized framework was progressively articulated, stress-tested, and extended.

The conceptual architecture guiding this dialogue was developed in active continuity with the texts *How Is a Relational Ontology Formally Relational?* and *Determinacy as Relational Achievement*. The former text provided the formal grounding and constraint structure of relational ontology, while the latter text articulated determinacy as relational achievement. They functioned not merely as cited sources but as the operative theoretical framework, formal grammar and interpretive context governing the direction, coherence, and permissible distinctions of the argument as it unfolded.

Rogers, T. M. (2025, October). *How is a Relational Ontology Formally Relational? A phenomenological exploration of the semiotic logic of agency in physics, mathematics, and biology*. Retrieved from <https://philpapers.org/rec/ROGWMA>

Rogers, T. M. (2026, February). *Determinacy as Relational Achievement: Symmetry, Constraint, and Individuation in Physics (Quantum Mechanics), Biology (Biosemiotics), and Interactive Formal Systems (Large Language Models)*. Retrieved from <https://philpapers.org/rec/ROGDAR>

Citations to academic literature supporting the theoretical framework, formal grammar and interpretive context can be found in the paper *How Is a Relational Ontology Formally Relational?*

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