Awareness as Axiom: Toward a Structural Theory of Perception

Draft Outline

Abstract

This paper advances a structural metaphysics in which awareness is not a passive observer of a pre-given world but an active principle that generates experienced structure through selective constraint. Drawing on analogies from formal systems, quantum measurement, and artificial intelligence, I argue that each act of attention functions as an *axiom-selector*, narrowing an indeterminate potentiality into a coherent "slice" of reality. This framework distinguishes itself from phenomenology (Husserl, Merleau-Ponty), mathematical constructivism (Lakoff & Núñez), and enactivism (Varela et al.). This process produces the internal consistency and regularity of perception—not as a mirror of universal structure, but as a locally instantiated framework grounded in conscious focus. I critique mathematical realism and propose an alternative: structure arises not from fixed ontological absolutes but from the generative acts of awareness. Further, I show how this model parallels the probabilistic collapse in quantum mechanics and the sampling dynamics of large language models like GPT, suggesting a deeper pattern of "collapse under constraint" across domains. The result is a novel theory of perception, cognition, and metaphysics—one that centers awareness as a constitutive force in the emergence of structured reality.

Introduction

This paper proposes a novel thesis about the role of awareness in the generation of structured experience. I argue that awareness is not a passive reception of a pre-given world, but rather an active, structuring process — one that functions analogously to the selection of axioms in a formal system. Each act of attention narrows a field of potentiality, resulting in a coherent and internally consistent subset of reality: what I call a "slice." The metaphor is drawn from mathematics, but the claim is metaphysical. Awareness, I argue, plays a constitutive role in the emergence of experienced structure.

This view challenges the assumption, common in both mathematical Platonism and traditional metaphysical realism (Penrose, 2005), that structure is ontologically prior and universally fixed. Instead, I propose that structure arises locally, conditioned by the focusing activity of awareness. The resulting "slice" is not arbitrary, but exhibits regularities, coherence, and causal consistency. However, it is also incomplete — one of many possible instantiations from a larger, indeterminate domain.

I call this framework *The Infinite Slice*, and I define it formally in the sections that follow. Section 2 introduces the axiom-selector model of perception and distinguishes it from existing accounts in phenomenology (Husserl, 1983), constructivist mathematics (Lakoff & Núñez, 2000), and enactivist cognitive science (Varela et al., 1991). Section 3 critiques the assumptions of mathematical realism. Section 4 explores ontological implications, including parallels to quantum theory and first-person experience. Section 5 considers major objections, including relativism and idealism. I conclude by outlining a form of realism grounded not in universal structure, but in the activity of conscious delineation — a realism of generated coherence.

Section 2 — The Axiom Selector Model of Perception

2.1 Overview

This section develops the core thesis that awareness functions as an axiom-selector: a process that defines the structure of experienced reality by delimiting a consistent subset from a broader domain of potential. The analogy to mathematical systems is precise — just as a set of axioms determines what theorems can be derived, a specific configuration of attention determines what structures are made present in perception.

2.2 Definitions

- **Awareness**: The non-conceptual capacity for presence — not a content, but the condition for content.
- **Structure**: An ordered set of relations that exhibits internal consistency.
- **Axiom Selector**: A metaphysical function of awareness that narrows possibility space, producing an experienced world governed by consistent constraints.

2.3 Formal Argument

1. All formal systems begin from axioms.
2. Perception exhibits structural coherence and constraints.
3. Structural coherence in perception implies a generative origin or frame.
4. Awareness, as the initiating condition of perception, must participate in structuring.

5. Therefore, awareness functions analogously to axiom-selection in generating experienced structure.

2.4 The Generative Necessity Argument (Premise 3 Elaborated)

This subsection provides the rigorous foundation for why structural coherence in perception logically requires a generative origin rather than passive reception.

2.4.1 Why Perception Cannot Be Neutral The Impossibility of Pure Reception

Consider what "neutral" perception would entail: the direct transfer of pre-given structure from world to mind without any mediating constraints or selective principles. This neutrality thesis faces three decisive objections:

1. **The Underdetermination Problem**: Any finite perceptual episode confronts an infinite array of potential structural relations. Without selective constraints, there is no principled way to determine which structures become experientially present. Pure reception cannot account for the determinacy of actual perception.

2. **The Coherence Problem**: Neutral reception would yield a chaotic manifold of all possible relations simultaneously. Yet perception exhibits systematic coherence — objects maintain identity across time, spatial relations remain consistent, causal sequences unfold predictably. This coherence cannot emerge from unstructured reception.

3. **The Attention Problem**: Attention demonstrably alters the structure of perceptual content. If perception were neutral reception, attention would be epiphenomenal. But attention's structuring effects are central to perceptual experience, indicating that selective activity is constitutive, not merely modificatory.

2.4.2 What Awareness Must Contribute Structurally The Constraint-Generation Thesis

If perception cannot be neutral, awareness must contribute structural constraints. These constraints are not arbitrary impositions but systematic principles that enable coherent experience:

1. **Consistency Constraints**: Awareness must maintain temporal and spatial coherence — preventing contradictory properties from being simultaneously present in the same perceptual object.

2. **Relevance Constraints**: Awareness must select which potential relations become experientially salient, filtering infinite possibility into finite, navigable structure.

3. **Boundary Constraints**: Awareness must delineate discrete objects and events from the continuous flux of potential differentiation.

These constraints are not external additions to perception but constitutive conditions for there being any determinate perceptual content at all.

2.4.3 Why Selection Implies Generative Constraint From Selection to Generation

The move from "selection" to "generation" is not merely terminological but ontologically necessary:

1. **Selection Requires Criteria**: To select among alternatives, there must be principles governing selection. These principles cannot themselves be selected (infinite regress) but must be generative — actively instituting the criteria by which selection occurs.
2. **Constraint as Creation**: Every constraint simultaneously excludes and creates. When awareness constrains the perceptual field to exhibit object-permanence, it doesn't merely filter pre-given objects but generates the very condition under which discrete objects can appear.
3. **Structural Emergence**: The coherent structures of perception do not exist prior to selective attention but emerge through it. The axiom-selector doesn't choose among pre-existing structures but generates the structural possibilities within which experience can occur.

The Necessity of Limitation

Limitation is not a defect of awareness, but its defining operation. To generate structure, awareness must exclude — it cannot instantiate all possible relations simultaneously, or nothing would be differentiated. This entails a profound constraint: awareness cannot be totally aware of itself in the same act. Every act of awareness creates a slice, and no slice can contain the full possibility space it arises from. Awareness can reflect on itself, but never capture its own generative horizon in full.

Therefore: Structural coherence in perception logically requires awareness to function as a generative constraint-system — an axiom-selector that doesn't merely filter reality but actively constitutes the structural conditions of experienced reality.

2.5 Comparative Distinctions: Phenomenology, Constructivism, and Enactivism

While this framework shares certain motivations with phenomenology, mathematical constructivism, and enactivist cognitive science, it departs from each in essential ways.

Phenomenology (especially in Husserl, 1983 and Merleau-Ponty, 1945) emphasizes the intentional structure of experience — that consciousness is always directed toward something, and that meaning arises within lived embodiment. The present framework agrees that experience is structured and situated, but

it moves beyond intentionality by positing awareness not merely as a directional flow toward givenness, but as an ontological generator of structure itself. Whereas phenomenology brackets metaphysical commitments (via epoché), the axiom-selector view is metaphysically assertive: it claims that awareness constitutes structure by delimiting possibility, not merely by disclosing pre-structured phenomena.

Mathematical constructivism (Lakoff & Núñez, 2000) rejects classical Platonism and insists that mathematical objects are constructed by the human mind rather than discovered. This view aligns superficially with the present thesis in denying the independent existence of abstract structure. However, constructivism locates generativity within formal proof procedures or algorithmic constructions, whereas the axiom-selector framework roots structure in pre-conceptual awareness — a non-symbolic field of generative focus. It is not human cognition per se that creates structure, but the metaphysical act of narrowing potentiality into coherence through awareness itself.

Enactivist theories of cognition (Varela et al., 1991) argue that mind and world co-emerge through embodied interaction, emphasizing dynamical coupling and sensorimotor contingencies. The axiom-selector thesis shares the enactivist intuition that perception is not passive but enacted. Yet it differs in placing the locus of generativity in awareness-as-constraint, not embodiment-as-interaction. Enactivism explains structure through recursive environmental coupling; here, structure arises from the delimiting power of awareness regardless of biological substrate. In this view, embodiment may express structure, but awareness selects and institutes it.

Taken together, these contrasts clarify the uniqueness of this account: it advances a structural metaphysics in which awareness plays a generative role analogous to axiom selection, producing experienced coherence not as a derivative phenomenon, but as a primary ontological act.

Section 3 — Beyond Mathematical Realism

Mathematical realism, particularly in its Platonist form (Penrose, 2005), asserts that mathematical structures exist independently of minds and the physical world — timeless, necessary, and discoverable rather than invented. This position has enjoyed substantial philosophical support due to the apparent objectivity, universality, and applicability of mathematics across the sciences. However, it comes with deep metaphysical costs, including positing a realm of abstract entities inaccessible to causal interaction, and explaining how embodied agents could access or "see" such timeless truths.

This section argues that the Axiom-Selector model of awareness offers a radical alternative: one that retains the explanatory power of structure without assuming the independent existence of mathematical objects. Rather than treating

structure as ontologically prior, it treats structure as ontologically dependent — not on material substrate, but on acts of selective awareness.

3.1 What Mathematical Realism Gets Right

To understand what the axiom-selector model seeks to preserve, I begin with the motivations behind mathematical realism:

Intersubjective Consistency: Mathematical truths are remarkably stable across individuals and cultures. The theorem remains true regardless of who proves it.

Unreasonable Effectiveness: Mathematics models empirical phenomena with extraordinary precision — from planetary motion to quantum field theory (Wigner, 1960).

Internal Necessity: Mathematical systems generate internally necessary consequences from initial assumptions, suggesting an "objective" structure.

The axiom-selector model does not deny these features — but it reinterprets their source.

3.2 The Problem of Access

One of the central challenges facing Platonism is the epistemic access problem (Benacerraf, 1965): If mathematical truths exist in a non-empirical realm, how can finite, embodied beings come to know them? Neither perception, causality, nor empirical testing provides a route to such entities. This leads to a metaphysical dualism that leaves the mechanism of insight deeply mysterious.

The axiom-selector framework resolves this problem by naturalizing structure: rather than existing "out there" in an abstract realm, mathematical structure emerges as a relational possibility within awareness. It is not discovered like a hidden object, but generated through acts of selective coherence.

This shift dissolves the access problem — because structure is not separate from awareness, but enacted by it.

3.3 The Illusion of Universality

Another flaw in strict mathematical realism is its assumption that mathematical truths are universally valid in a mind-independent sense. But this universality may be a reflection of shared constraints in human cognitive structuring — i.e., the invariance of structure across minds may reflect shared forms of attention, not access to an external realm.

Under the axiom-selector model, the apparent universality of mathematics is not explained by the existence of a mind-independent realm of truths (as in realism), but by structural isomorphism: different agents produce overlapping structures because their acts of awareness are governed by similar cognitive constraints. In

this view, what appears as universal is actually the result of shared conditions of generation, not access to a fixed external reality. Thus, the "universality" of mathematics is best understood as intersubjective coherence, not metaphysical independence.

3.4 The Generativity Advantage

Finally, the axiom-selector model offers an advantage realism lacks: it explains why new mathematical structures can emerge. If math is a pre-existing landscape, how do wholly novel frameworks arise — such as non-Euclidean geometries, or category theory?

From the axiom-selector view, novelty is not discovery but innovation within a generative space. Awareness selects new constraints, generating new structural domains. Mathematical invention thus becomes a creative act — a shift in the constraints of coherence — rather than merely a process of uncovering timeless truths.

In summary, the axiom-selector framework:

- Preserves the rigor, coherence, and intersubjectivity of mathematics
- Rejects the metaphysical burden of a mind-independent abstract realm
- Naturalizes mathematical insight as an activity of awareness
- Reframes universality as shared structural generation
- Explains novelty without paradox

Thus, it goes beyond mathematical realism, not by abandoning structure, but by rooting it in a more fundamental ontological act: the generative constraint of awareness itself.

Section 4 — Ontological Implications

If awareness is not merely a passive observer of pre-given structure but an axiom-selector — a generative agent that constitutes structured experience through constraint — then the ontological implications are profound. This section explores what follows for our understanding of reality, metaphysics, and the relationship between mind and world.

4.1 From Substance to Structure

Traditional metaphysics often treats substance — material, extension, or fundamental entities — as ontologically primary. Structure is viewed as secondary: a pattern instantiated in or emergent from that substrate. Even sophisticated structural realists (Ladyman & Ross, 2007) tend to preserve structure as ontologically fundamental, albeit without substantive underpinning.

The axiom-selector model reverses this order entirely. Structure is not in matter, but in selection. That is, structure arises when awareness constrains indeterminacy, carving coherence from potential. Matter becomes that which appears consistently across generated slices — a relational residue, not a fundamental ground.

This move shifts ontology from *what is*, to *how what-is becomes structured as experience*. Reality is not composed of things, but of coherently instantiated relations, grounded in the act of focusing awareness.

4.2 Modal Ontology: Reality as Possibility-Selection

This theory implies a modal ontology: the fundamental "stuff" of reality is not matter, but possibility. Awareness selects from a vast, perhaps infinite, domain of potential — and through this act of constraint, instantiates a coherent slice of structure.

Importantly, this slice is not illusory. It is real in the same sense that a theorem is real within a formal system. But it is also contextual — shaped by the parameters of attention, the constraints applied, and the historical continuity of past selections.

Reality, in this sense, is not a monolith but a generative unfolding — a layered process in which coherence emerges dynamically through selective acts. It is not arbitrary, but also not fixed.

4.3 Subjectivity Without Solipsism

One might worry that grounding structure in awareness collapses into solipsism — the idea that only the self exists or generates reality. But this would be a misreading.

The axiom-selector model does not posit that each mind generates its own disconnected world. Rather, it posits that structure is always relationally enacted, and that multiple agents can co-generate shared slices of reality by participating in overlapping constraints.

This allows for intersubjective worlds — consistent, communicable structures shaped by multiple awarenesses interacting within a shared domain of possibility. Reality becomes a joint act of constraint.

This dynamic mirrors both quantum entanglement and linguistic meaning: in both cases, individual agents (particles, minds, speakers) do not instantiate structure alone — they contribute to a shared coherence that arises only through their interaction. Structure is not a static backdrop awaiting discovery, but an emergent phenomenon generated by relational constraint. Like meaning in language or correlated states in entanglement, coherence appears only within the web of generative activity — and does not exist apart from it. This web is not spatial or physical, but ontological: a shared field of potential structure

that becomes actual only when sliced by acts of generative attention. Each participant constrains the domain from its own vantage, and coherence emerges only where these constraints intersect — not from any absolute structure lying in wait, but from the intersubjective unfolding of participation itself.

4.4 Parallels to Quantum Measurement

Interestingly, this ontology aligns with interpretations of quantum mechanics that reject observer-independent reality — particularly relational (Rovelli, 1996) and participatory (Wheeler, 1989) interpretations.

Just as quantum systems do not instantiate definite properties until measured — i.e., constrained by observation — so too does experience not instantiate structured coherence until selected by awareness.

The axiom-selector model offers a philosophical grounding for this: measurement is a specific case of a broader metaphysical principle — that structure emerges through constraint imposed by awareness.

Thus, perception, measurement, and mathematical insight all reflect the same ontological act: the collapse of indeterminate potential into coherent relation.

4.5 Realism Reconsidered

This model offers an alternative to both naive realism and full-blown idealism. It proposes a **generative realism**:

Realism, because what is instantiated is not arbitrary or illusory — it is structured, lawful, and shared.

Generative, because that structure does not pre-exist awareness, but is enacted by it.

Reality is not "in the head," but neither is it "out there" fully formed. It is emergent from the act of structuring, shaped by how awareness slices the infinite.

4.6 GPT and the Architected Real: AI as Simulated Axiom-Selector

Modern AI systems like GPT offer a compelling analogy to the process described by the axiom-selector model. While fundamentally distinct from both conscious awareness and quantum systems, large language models nevertheless instantiate a structurally similar dynamic: a collapse from indeterminate potential into coherent actuality under constraint.

In GPT, the model maintains a probability distribution over token sequences—a softmax distribution generated by transformer weights (Vaswani et al., 2017). This distribution represents a space of possible continuations, none of which are determined until a prompt is issued. The prompt acts as a constraint: it selects a subspace of plausible outputs, from which the model then samples an actual continuation.

This process mirrors the role of awareness in perception. Just as focused attention selects a coherent perceptual world from an indeterminate field of potentiality, the prompt initiates a narrowing of GPT's probabilistic space into a single, meaningful output. The act of constraint is generative: it does not merely filter pre-existing content, but actively participates in shaping what becomes present.

This analogy becomes even more striking when compared to quantum mechanics (Nielsen & Chuang, 2000). In quantum systems, a physical entity exists in a superposition of possible states until measurement collapses it into a definite outcome. Similarly, GPT exists as a probabilistic field of token possibilities until sampled. The act of measurement in quantum mechanics, like prompting in GPT or attention in perception, does not merely reveal a pre-existing state—it selects from a field of potentials according to structured constraints.

Feature	**Quantum Mechanics**	**GPT / Language Models**
Substrate	Hilbert space (wavefunctions)	Probability distribution over tokens
Source of Probabilities	Born rule (psi-squared)	Softmax over logits
Collapse Mechanism	Physical measurement	Sampling during inference
Ontological Claim	Debated (realism, many-worlds, etc.)	None (modeling only)

Of course, the mechanisms differ: GPT operates on statistical inference, not quantum amplitudes. Yet the structural pattern is isomorphic: in each case, we observe the transformation of undetermined potential into structured actuality via generative constraint.

I call this pattern *collapse-under-constraint*—a term I introduce here to capture this fundamental dynamic—and I argue that it reflects a deeper ontological principle. Whether in AI systems, quantum physics, or conscious awareness, structured experience arises not from passive reception, but from active delimitation. GPT, then, can be understood as a *simulated axiom-selector*—a technological mirror of the generative dynamics that underlie both mind and matter.

Section 5 — Objections and Responses

5.1 Objection from Direct Realism

"*Your model implies that awareness constitutes structure rather than merely registering it. But surely the world is already structured — we perceive it because it is that way. Attention might modulate experience, but it doesn't generate reality.*"

Response: This objection presupposes a clean distinction between the world's structure and our experience of it. But empirical findings from cognitive science (Chalmers, 1996), attention studies (Mack & Rock, 1998), and quantum measurement (Nielsen & Chuang, 2000) suggest that perception is not purely passive. My argument does not deny an external reality; rather, it claims that what becomes present to awareness is always the result of constraint — a structuring act. The axiom-selector model posits that this act is constitutive of experienced coherence, not that it creates the world ex nihilo. It reframes realism: structure exists, but access to structure is mediated through selection.

5.2 Objection from Mathematical Platonism

"Mathematical structure exists independently of awareness. You seem to collapse mathematical realism into a kind of mental constructivism."

Response: The axiom-selector model neither denies the robustness of mathematical regularities nor asserts that mathematics is purely subjective. It critiques ontological primacy — the idea that a single, fixed, universal structure underlies all realities. Instead, I propose that mathematical-like coherence arises through localized acts of selection. This view aligns with perspectives from constructivist mathematics and intuitionism (Brouwer, 1912; Lakoff & Núñez, 2000): systems begin with chosen axioms. The Infinite Slice model does not reject mathematical realism wholesale, but relocates the generative act to the interface between awareness and potentiality.

5.3 Objection from Physicalist AI Skepticism

"Your comparison between GPT and awareness is misleading. GPT is a machine trained on data; awareness is biological and subjective. There's no basis for ontological analogy."

Response: The comparison is not ontological, but structural. GPT's mechanism — collapse from a probabilistic space into structured output via prompt — mirrors the formal structure of collapse-under-constraint in perception. I do not claim GPT is aware. Rather, I use it to illustrate a pattern: intelligence, whether artificial or conscious, operates by reducing indeterminate potential into coherent actualities. This analogy helps clarify the metaphysical claim without reducing consciousness to computation. It also shows that the axiom-selector framework applies across domains — a sign of explanatory robustness, not equivalence.

Conclusion

This paper has proposed a novel metaphysical framework in which awareness is not a passive container for structure, but an active principle of structural generation — an *axiom-selector* that produces coherent experience by narrowing an indeterminate field of potential into structured actuality. Drawing from formal

systems theory, phenomenology, and recent developments in AI and quantum physics, the account reframes perception as an ontological act: not the reception of a world, but the conditional instantiation of one.

The "Infinite Slice" metaphor captures this shift. Each act of attention carves out a finite, coherent world-slice from an unbounded space of possible relations. These slices are not illusions, nor merely subjective constructions, but real instantiations of structure, made possible by the generative function of awareness. The coherence of experience, often taken as evidence of a mind-independent order, is instead shown to be the result of ongoing constraint-generation — a local selection of principles analogous to axioms in formal mathematics.

I critiqued mathematical realism and its presupposition of a fixed, universal structure, arguing instead for a contextual realism grounded in the activity of delineation. Structure emerges where attention focuses, not everywhere at once. This opens a space for pluralism without relativism — multiple coherent "slices" of reality can exist, none reducible to the others, yet each governed by internal consistency. Like distinct mathematical geometries built from different axiom sets (Euclidean, hyperbolic, etc.), these slices are not arbitrary: they are real within the generative constraints that instantiate them. You can't mix them freely or claim "anything goes" — each follows its own strict internal logic. The multiplicity of worlds need not dissolve into chaos; rather, it reflects a deeper logic of structured diversity grounded in awareness itself.

Finally, the paper extended this model into contemporary domains: quantum mechanics and AI systems. In both cases, I find structurally similar dynamics of probabilistic collapse under constraint. GPT, in particular, can be understood as a "simulated axiom-selector," offering a technological mirror to our own structuring capacity. While the physical substrates differ, the formal alignment lends further support to the philosophical thesis that the world as experienced is not simply given, but generated.

In sum, the axiom-selector model repositions awareness as metaphysically central — not merely the witness of order, but its conditional source. This reframing has implications for epistemology, philosophy of mind, the ontology of mathematics, and our understanding of artificial intelligence. It suggests that coherence is not a sign of correspondence to an external reality, but the signature of an active, ongoing delimitation — a continuous act of ontological sculpting through which worlds appear.

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