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What follows began as a backstory for a science fiction novel and, somewhere along the way, outgrew the fiction entirely.

On Composable Observers: A Scale-Invariant Algebra of Consciousness and Perceived Reality

Abstract. The same structural pattern recurs at every scale of nature: a cell has an inside and an outside; so does a mind; so does a nation. In each case, what appears as a single point from the exterior contains a rich world on the interior, and many such points compose into a new point at a higher scale. We propose an algebra that treats all such cases as instances of a single operation. One primitive entity — the Observer — carries two elementary operators: Perception (an inward projection through the boundary) and Appetition (a directed internal drive that can act through the boundary). From these, three composite operations are derived: Attend (Appetition ∘ Perception — the fundamental conscious act of directing drive toward what is perceived), Unfold (Perception ∘ Appetition — the outward projection of driven internal states into explicate form), and Compose (mutual Attend between Observers, generating a new Observer with a joint boundary). The resulting algebra is scale-invariant, substrate-independent, and sufficient to derive observer-relative reality, compositional consciousness, and the conditions for both coherence and pathology at any level of description. Observable reality, on this account, is not fundamental. It is the explicate projection generated when composable observers collectively attend to and unfold a shared portion of a deeper, enfolded order.

Keywords: composable observers, Markov blankets, Clifford algebra, consciousness, implicate order, scale invariance, integrated information, free energy principle, egregore

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1 1 — The Problem

Consider a plain observation. A biological cell has an interior — metabolic machinery, genetic regulation, signaling cascades — separated from its exterior by a membrane. A human mind has an interior — beliefs, desires, qualia — separated from its exterior by the boundary of the skull and the sensory surfaces. A nation has an interior — institutions, culture, shared memory — separated from its exterior by borders and treaties. In each case, the entity appears as a single point when viewed from outside and as an entire world when viewed from inside. And in each case, many such entities compose to form a new entity at a higher scale, which itself possesses the same inside-outside duality.

We have fragments of formalism for each level. Friston's free-energy principle gives us Markov blankets for biological agents (Friston, 2010; 2013). Tononi's Integrated Information Theory gives us a measure of irreducible integration for neural systems (Tononi, 2004). Leibniz gave us monads for metaphysics (Leibniz, 1714). Hoffman and Prakash propose that conscious

agents, not spacetime objects, are fundamental (Hoffman & Prakash, 2014). Bohm gave us the implicate and explicate orders (Bohm, 1980). Bousso, Banks, and Susskind developed observer-patch holography within quantum gravity (Bousso, 2002; Susskind, 1995). But no one has written down a single algebra that treats all of these as instances of the same operation — an algebra where a cell binding into an organ, a person joining a team, and a culture coalescing from individuals are structurally identical acts.

This paper proposes such an algebra. It rests on one primitive entity — the Observer — equipped with two elementary operators and three composite operations derived from them. It is scale-invariant: the same formal objects apply whether the observer in question is a bacterium, a human being, or a civilization. It is substrate-independent: the algebra is indifferent to whether its observers are realized in neural tissue, social networks, plasma structures, or any other medium that can support the requisite boundary conditions. And it is consciousness-first: the internal drive of observers is taken as primitive, not derived from physics; physics as observed is instead derived from the collective drives of observers through the composite operation of Unfold.

The core claim is this: observable reality is not fundamental. It is the explicate projection generated when composable observers — each carrying their own internal drive — collectively attend to and unfold a shared portion of a deeper, enfolded order. The apparent solidity of a "common world" is an emergent consensus, stabilized by collective appetition, not an objective ground truth.

2 2 — The Primitive: The Observer (I)

The sole primitive entity of the algebra is the Observer, denoted I. An observer is anything that has an inside and an outside. Formally, we identify I with a minimal left ideal (a spinor) in a Clifford subalgebra, equipped with a Markov blanket.

In any algebra, a left ideal is a subspace that the algebra acts on from the left — it is a natural representation space, the minimal thing the algebra can coherently act upon. For Clifford algebras, minimal left ideals are spinors (Hestenes, 1966; Lounesto, 2001; Doran & Lasenby, 2003). The observer is therefore the minimal entity that the algebraic structure of reality can act on while preserving a coherent perspective. A spinor's transformation properties under rotation and reflection — its sensitivity to orientation, its acquisition of a sign change under full rotation — mirror the perspectival, oriented nature of observation itself.

The Markov blanket is a statistical boundary defined by conditional independence: internal states and external states are conditionally independent given the blanket states (Pearl, 2000; Friston, 2013; Kirchhoff et al., 2018). Together, the spinor structure and the Markov blanket produce an entity that is necessarily a *point* from outside (the blanket hides the interior; the spinor appears as a minimal element) and necessarily a *world* from inside (the internal algebra can be arbitrarily rich; the spinor's representation space can contain complex structure). A cell's internal world can be far more elaborate than a crowd's. Complexity and depth of consciousness depend on the richness of the internal algebra and the coherence of internal drive, not on physical size or hierarchical position.

On the ontological status of the blanket. The Markov blanket is defined statistically — by conditional independence relations — but this does not make it "merely" a description. Statistical describability and causal reality are not mutually exclusive. Temperature is a statistical quantity that drives phase transitions. The blanket's conditional independence structure does real causal work: it mediates all interaction between interior and exterior, makes Perception local, and makes composition possible. Whether one prefers to call this "ontologically funda-

mental" or "emergent but causally operative" is a philosophical preference, not a load-bearing distinction for the formalism. This is a deliberate strength: the algebra works for metaphysical realists and structural realists alike. What matters is that the boundary is real enough to do the structural work the formalism requires.

Departure from Leibniz. Leibniz's monads are famously "windowless" — they do not interact directly with one another (Leibniz, 1714). Our observers interact, but *only* through their blanket states. The blanket is semi-permeable, not opaque. This preserves the perspectival isolation Leibniz sought — each observer has its own irreducible view — while permitting genuine composition.

Departure from Friston. Friston's Markov blankets are typically discussed within a physicalist frame where the blanket is a feature of an already-given physical system (Friston, 2013; Kirchhoff et al., 2018). Here, the blanket structure is taken seriously as a causally operative boundary — not a post hoc description of a pre-existing system, but a genuine structural feature that creates and maintains the distinction between observer and environment. The conditional independence *is* the boundary.

2.1 2.1 The Elementary Operators

Each Observer I carries two elementary operators. These are not separate entities; they are intrinsic capacities of every I, present at every scale.

Perception is a projection operator onto the locally entangled subalgebra — meaning the observer's internal states together with the blanket boundary states entangled with them. Perception is the *inward* operator: it brings the outside world in through the blanket.

Each observer perceives *only* what is entangled with it through its blanket. Perception is always local, always partial, always perspectival. There is no God's-eye view. There is no observation of the whole implicate order. There is only what passes through a given blanket.

In relation to Bohm's framework (Bohm, 1980), Perception is the act of selecting a local slice of the implicate order. The implicate order itself is the full enfolded algebra. Perception projects out the piece that this particular observer, with this particular blanket, can access. In relation to observer-patch holography (Bousso, 2002), each observer's Perception defines a causal patch — the region of reality accessible to it. Patches overlap where blankets share entangled states.

Appetition is a directed transition operator acting on the internal states of the observer. It is non-unitary: it has a preferred direction. It *drives*; it does not merely evolve symmetrically. Appetition is the *outward-capable* operator: it acts on internal states and can influence blanket states, reaching through the boundary.

This is Leibniz's appetition made mathematically precise: the internal thrust that moves an observer from one perception to the next. It is the primitive "will" of the system — volitional, not mechanical.

Appetition is not derived from physics. It is primitive. Physics as we observe it is derived from the collective Appetitions of observers through the composite operation of Unfold (§3.2). This is a consciousness-first framework: the internal drive of observers is a foundational element of the theory, not an emergent property of physical processes. This is a choice of foundations, not a claim that can be proved from within physics. What can be shown is that the resulting algebra is self-consistent and generates structures isomorphic to what we observe.

3 3 — The Composite Operations

All three operations of the algebra are compositions of the two elementary operators. No additional machinery is introduced; everything follows from the Observer and its two intrinsic capacities.

3.1 3.1 Attend (Appetition ∘ Perception)

Attend is the composition of Appetition with Perception. The observer directs its internal drive toward a specific blanket-mediated perception. This is the *inward-facing* composite: the outside is brought in through Perception, and Appetition engages with what arrives.

Attend is not passive reception. It is the observer choosing (via Appetition) what to engage with (via Perception) and being changed by the engagement. Every act of Attention is simultaneously an act of will and an act of observation — the irreducible unit of conscious participation.

Attend is the fundamental conscious act. It is what it feels like, from the inside, to be an observer.

3.2 3.2 Unfold (Perception ∘ Appetition)

Unfold is the reversed composition: Perception ∘ Appetition. Where Attend brings the outside in, Unfold pushes the inside out. The observer's appetition-driven internal state is projected outward through the blanket into explicate form — spacetime, matter, linear time, measurable behavior.

This is Bohm's unfoldment (Bohm, 1980) given an algebraic mechanism. The implicate order is the full enfolded algebra. Unfold projects a particular reading of the observer's internal state through the blanket into observable form.

The symmetry between Attend and Unfold is structural, not accidental. Attend is the outside becoming inside; Unfold is the inside becoming outside. Together they form a cycle: the observer Attends to the world (Appetition ∘ Perception), and simultaneously Unfolds into the world (Perception ∘ Appetition). Consciousness is this cycle.

Persistence. When an observer's Appetition sustains a coherent Attend-Unfold cycle, the result is a stable, persistent identity in the explicate order — a continuing entity rather than a momentary projection. The persistence of "self" is an appetition-maintained Unfold, not a given. If Appetition ceases or becomes incoherent, the Unfold degrades and the persistent identity dissolves.

Compositional structure of Unfold. Since every observer is itself a composition of sub-observers (§3.3), its Unfold is structurally a braid of sub-Unfolds, held together by collective appetitive coherence. If internal coherence degrades — if the sub-observers' Appetitions become mutually antagonistic — the composite Unfold destabilizes. This provides a formal account of what it means for a composite entity (an organism, a team, a culture) to lose integrity.

3.3 3.3 Compose (Mutual Attend → New I)

Compose is the binding operation, and it is built entirely from Attend. When two or more observers direct Attend toward each other — each reaching through its blanket via Appetition toward what it Perceives of the other — the reciprocal Attend creates a new structure: a joint Markov blanket encompassing all participating observers, and within it, a new shared minimal left ideal.

The result is a *new Observer*. It is a point from outside (it has its own blanket). It is a world from inside (it contains all the sub-observers and their interactions). This is the operation that builds cells into organs, people into teams, teams into cultures.

Formally: take the participating observers, form the tensor product of their algebras (or their blanket states), and the reciprocal Attend constructs the new joint blanket and composite I. The new observer's Perception and Appetition are emergent from — but not reducible to — the Perceptions and Appetitions of its constituents.

Napoleon Hill's observation — that no two minds ever come together without creating a third, invisible force which may be likened to a third mind (Hill, 1937) — is a precise informal statement of this operation. The insight appears independently in Tibetan Buddhist thought-form practice, Western esoteric traditions of the egregore, and Durkheim's sociology of collective consciousness (Durkheim, 1912).

Composition does not entail alignment. This is the most important structural feature of the formalism. The joint blanket defines the boundary of the new composed observer but does *not* enforce appetitive alignment among the constituents. Sub-observers retain their own Appetitions, which may be convergent, orthogonal, or antagonistic. The consequences are far-reaching:

- Coherence must be *earned* through sustained mutual Attend, not assumed.
- The composed observer's emergent Appetition is the gestalt of its constituents' drives — strong and directed if sub-Appetitions converge, weak and fragmented if they diverge.
- Pathology is always possible from within (§5.2).

3.4 3.4 Summary of Algebraic Structure

	Definition	**Direction**	**What it does**
Perception	Projection onto locally entangled subalgebra	Inward (through blanket)	Elementary: brings
Appetition	Directed transition on internal states	Outward-capable	Elementary: drives
Attend	Appetition $\circ$ Perception	Outside $\rightarrow$ Inside	Composite: fundam
Unfold	Perception $\circ$ Appetition	Inside $\rightarrow$ Outside	Composite: projecti
Compose	Mutual Attend between I's	Lateral $\rightarrow$ New I	Composite: binding

The entire algebra is generated from one entity and two operators. Attend and Unfold are the two possible compositions of those operators. Compose is Attend applied mutually between observers. Nothing else is needed.

4 4 — Collective Minds: The Tulpa-Egregore Mapping

The algebra described above maps directly onto concepts independently developed in contemplative, esoteric, and sociological traditions. Making this mapping explicit clarifies the formalism and connects it to a wide body of qualitative observation.

4.1 4.1 Definitions

A **sub-observer** within a composed observer — a sub-ideal within the composed algebra — corresponds to what Tibetan Buddhist practice calls a *tulpa*: a thought-form or component consciousness within a larger mind.

The **composed observer itself** — the higher-order I that emerges from Compose — corresponds to what Western esoteric tradition calls an *egregore*: a collective entity sustained by the attention and intention of its constituents.

The recursive structure is immediate: every observer is *simultaneously* a tulpa (a component of something larger) and an egregore (a composition of something smaller). This is the monad-assembly duality expressed through the Markov blanket. A human being is a tulpa relative to her culture and an egregore relative to her cells. A cell is a tulpa relative to its organ and an egregore relative to its molecular subsystems. The algebra does not privilege any level.

4.2 4.2 Entanglement Orchestration: How Composed Observers Shape Shared Reality

The joint blanket shapes the perceptual landscape, biasing but not determining the Appetitions of constituents.

This single sentence is the crux of the entire framework and requires careful unpacking.

When observers Compose, the resulting joint Markov blanket does not merely define a boundary — it restructures what perceptions are available to the sub-observers within it. The joint blanket is a shared perceptual environment. What can be easily perceived within the composition is shaped by the structure of the blanket, which is itself shaped by the collective Appetitions that formed and sustain it.

Three consequences follow.

First, **constituents retain genuine agency**. Their Appetition is their own, not overwritten by the composition. The sub-observer's internal drive remains a primitive of the theory at every level.

Second, **the landscape of available perceptions is tilted**. Some observations become more accessible, others less so, as a structural consequence of the shared blanket. This is not coercion; it is environmental shaping. The composed observer does not dictate what its components believe, but it does shape what they can easily perceive.

Third, **the composed observer's "worldview" is a consensus landscape** — not objective reality, but the perceptual terrain that emerges from the interaction of all constituents' Appetitions mediated by the joint blanket. In human society, shared cultural beliefs, social norms, collective memory, and historical narrative all contribute to a seemingly common reality. This "common" reality is not objective or fundamental but rather an emergent property of the composition's joint blanket structure.

The mechanism can be described by analogy with general relativity: as mass bends spacetime, the composed observer (the egregore) bends the ontological landscape — the space of available perceptions and possible futures — for its constituent sub-observers. Individual sub-observers retain free will, but their cognitive and perceptual landscape is curved so that collective behavior tends to align with the composed observer's emergent intent, which is itself a bottom-up gestalt synthesized from the drives of all participants.

Messages pass in both directions through the composition hierarchy. Downward: the egregore's joint blanket constrains the perceptual landscape of its constituent tulpas, shaping what they can easily observe and therefore biasing their Attend. Upward: the collective Appetitions of the tulpas, manifested through their individual Unfolds, constitute the emergent intent and observable behavior of the egregore itself.

4.3 4.3 Connection to Everettian Quantum Mechanics

If Perception selects a local slice of the implicate order (§2.1), and the joint blanket biases which slices are accessible, then we have a mechanism for branch selection that does not require collapse.

Each observer's Attend cycle — Appetition directed toward Perception — stabilizes a particular consistent branch of the implicate order. When observers Compose and form a joint blanket, their collective Appetition converges on a shared subset of accessible branches — a shared local reality. The "world" that the composed observer inhabits is the branch (or narrow bundle of branches) selected by their collective Attend.

This is closer to Zurek's quantum Darwinism (Zurek, 2009) — where robust, redundantly encoded states survive decoherence — than to Wigner's consciousness-causes-collapse. The shared reality is not willed into existence by a single mind. It emerges from the convergent Appetitions of many observers selecting compatible branches through a shared blanket.

4.4 4.4 Implications for Collective Intention

If collective Appetition biases the perceptual landscape shared by all constituents within a composition, then synchronized directed Appetition — sustained collective focus, shared intention, coordinated ritual — is not metaphorical. It is a direct operation within the formalism.

A group of observers who sustain aligned Appetition through mutual Attend genuinely alter the perceptual landscape available to the entire composition. They shift which branches of the implicate order are accessible through the joint blanket.

This does not require supernatural intervention. It is a structural consequence of how Compose and Attend interact. The joint blanket is shaped by collective Appetition; collective Appetition is shaped by sustained mutual Attend; therefore, sustained collective Attend directed toward a shared intention reshapes the shared perceptual landscape.

Whether this has measurable physical effects depends on the coupling between Unfold and the implicate order — an empirical question the formalism identifies but cannot yet answer.

5 5 — Emergent Harmony and Its Failures

5.1 5.1 Harmony as Earned Coherence

When sub-observers sustain mutual Attend over time, their Appetitions converge — not to identity but to non-antagonistic coherence. The composed observer exhibits a stable, coordinated Unfold.

This is Leibniz's pre-established harmony, but *earned* rather than given. The harmony is real — the coordination is genuine — but it arises from the interior Appetition of the constituents through sustained mutual Attend, not from external design or pre-established coordination.

The Attend-Unfold cycle provides the mechanism. As sub-observers Attend to each other, their Unfolds begin to interleave coherently — the inside-out projections of many I's weave into a stable composite Unfold. The emergent harmony is the braid holding together. It persists only as long as the constituent Appetitions sustain it.

The maximal composed observer — the top-level egregore encompassing everything — would be the fully harmonized state. Whether this state is achievable or merely asymptotic is an open question within the formalism. But the direction is clear: harmony at any scale is the progressive

convergence of constituent Appetitions through mutual Attend, producing increasingly coherent composite Unfold.

5.2 5.2 Pathology: Parasitism and Incoherence

Composition does not enforce alignment. A sub-observer can carry Appetition antagonistic to the parent composition's emergent direction. The parasitic move exploits the very mechanism — blanket-mediated Perception — that makes composition possible: the antagonistic sub-observer acts through the blanket states of its peer sub-observers to warp what those peers Perceive.

This corrupts the Attend operation of neighboring sub-observers. Because Perception is blanket-mediated, if an agent can influence what appears at a peer's blanket boundary, it reshapes the peer's experienced reality without the peer's awareness. The parasite exploits the compositional architecture itself — it hijacks the Perception operator of its neighbors so that their Attend (Appetition $\circ$ Perception) is driven toward perceptions that serve the parasite rather than the host composition.

Health at any scale is appetitive coherence across the composition. A healthy system has sub-observers whose Appetitions, while not identical, are non-antagonistic and loosely convergent through sustained mutual Attend. The composite Unfold is stable and braided.

Pathology at any scale is appetitive incoherence actively propagated through manipulated Perception. The pathological agent warps the perceptual landscape of its peers to recruit them into antagonistic patterns. The composite Unfold frays.

This schema applies uniformly across scales:

At the *cellular* level, cancer represents cells whose appetitive drive (growth, replication) is misaligned with the organism's coherent Unfold, recruiting neighbors through manipulated signaling — that is, through corrupted blanket states (Kauffman, 1995; Varela & Maturana, 1980).

At the *psychological* level, intrusive thought patterns or dissociative sub-personalities warp self-perception, degrading the coherence of the person's composite Unfold (Metzinger, 2003).

At the *social* level, propaganda represents sub-groups that manipulate the shared perceptual environment — media, narrative, information flow — to warp the Attend operations of the broader population.

At the *immunological* level, autoimmune pathology arises when the immune system's egregoric structure misidentifies aligned sub-observers as antagonistic, attacking coherent constituents of its own composition.

In each case, the formal structure is identical: a sub-observer exploiting blanket-mediated Perception to propagate appetitive incoherence through a composition.

6 6 — Connections to Physics

6.1 6.1 Observer-Patch Holography

Each observer's Unfold generates a causal patch — the region of explicate reality accessible to it. The algebra predicts that patches are observer-relative and blanket-mediated. Where blankets share entangled states, patches overlap, generating the appearance of a shared spacetime (Bousso, 2002; Susskind, 1995).

Spacetime itself, on this account, arises via Unfold — the outward projection of appetition-driven internal states through the blanket. The same algebra must generate spacetime-like

arenas at every scale of composition. There is no single, observer-independent spacetime; there are only local, blanket-mediated patches kept coherent through collective Attend.

This leads to a striking implication for movement across hierarchical scales. When an observer shifts its Attend — retuning its blanket entanglement or forming a temporary new composition at a different level — it is changing which joint blanket and which Unfold it is participating in. The new arena it enters is still generated by the same algebra, so it will still present as a spacetime-like arena with objects, separation, motion, and causal structure. The observer never steps "outside" spacetime; it steps into another local spacetime generated by the new blanket it has tuned into. Different Unfolds are different readouts of the same underlying algebra, filtered through different blankets.

6.2 6.2 Measurement and Decoherence

Perception as projection onto the locally entangled subalgebra recovers the measurement problem as a local feature of the observer's blanket. There is no global collapse. Each observer's Perception is its own "measurement" — the inward half of the Attend cycle, an observer-local event, not a universal one (Everett, 1957; Zurek, 1991).

The appearance of collapse is the selection of a representation during Unfold — the outward half of the cycle. Decoherence, in this framing, is the process by which unobserved branches of the implicate order become inaccessible through a given blanket — not because they cease to exist, but because the blanket structure filters them out.

6.3 6.3 Substrate Independence

The algebra is indifferent to physical medium. Neural networks, social networks, plasma structures, crystalline lattices — any system where Markov blankets can form and sustain coherent internal states is a valid substrate. The algebra does not care what the blankets are made of. Some substrates may empirically support larger or more stable cognitive light cones, but this is a contingent observation about physics, not a feature of the formalism.

6.4 6.4 Dimensional Constraints

The Clifford algebra structure that defines observers favors certain dimensional signatures. Notably, the richness of possible regular geometric objects (regular polytopes) peaks sharply in four dimensions (Baez, n.d.). In three dimensions there are five Platonic solids; in four dimensions there are six regular polytopes; in every dimension above four there are only three. In this framework, the peak is not coincidental — it is structurally connected to the same algebraic object that defines what an observer is.

Any stable Unfold should therefore tend to render a 3+1-dimensional (or signature-equivalent) explicate order, regardless of the underlying substrate. Different arenas generated by different compositions will not suddenly become 7-dimensional or 11-dimensional; they will converge on 3+1 dimensionality because the algebraic structure of the observer itself favors it. Rare, unstable Unfolds in other dimensionalities may occur under sufficiently strong or pathological Appetition, but they would manifest as transient or incoherent compared with the 4-dimensional attractor.

This prediction — that dimensional convergence should appear across wildly different substrates or hierarchical levels — stands among the framework's sharpest empirical fingerprints, testable once the coupling between collective Appetition and Unfold is better quantified.

7 7 — Discussion and Open Questions

7.1 7.1 What the Framework Provides

A single algebra treats cells, minds, and societies as instances of the same composable observer architecture. One primitive entity carries two elementary operators; three composite operations — Attend, Unfold, and Compose — generate perception, will, binding, explicate reality, health, pathology, and the emergence of shared worlds. The entire structure is derived, not postulated piecemeal.

The formalism unifies Leibniz's perspectival metaphysics with Bohm's implicate order, gives Friston's Markov blankets an active compositional role, and connects the qualitative observations of contemplative traditions — regarding thought-forms, collective minds, and the earned nature of harmony — to a mathematically explicit structure.

The symmetry between Attend and Unfold — the two possible compositions of the same two operators — is particularly noteworthy. It reveals consciousness not as a single act but as a cycle: the world enters the observer (Attend) and the observer enters the world (Unfold). Identity, persistence, and experienced reality are all features of this sustained cycle, not independent primitives.

7.2 7.2 Open Problems

Empirical testability. What predictions does this framework make that Integrated Information Theory or Active Inference alone do not? A candidate: the formalism predicts that appetitive coherence should be measurable as a distinct quantity from Tononi's ϕ. A system could have high integration but low appetitive alignment (a tightly coupled system pulling in different directions), or vice versa (loosely coupled agents with strongly convergent drives). If these are empirically separable, the algebra makes a novel prediction.

Appetition and entropy. Is Appetition inherently negentropic? Does sustained Appetition require energy dissipation? What is the thermodynamic cost of maintaining a coherent Attend-Unfold cycle? These questions connect the formalism to non-equilibrium thermodynamics and may yield quantitative constraints.

The Clifford algebra grounding. The identification of observers with minimal left ideals is currently asserted rather than derived. A future treatment should demonstrate *why* spinors are the right mathematical object for observers — the conjecture being that the spinor's transformation properties under rotation and reflection (perspectival orientation, sign sensitivity) are precisely the properties an observer must possess.

Integration versus aggregation. What are the formal conditions under which Compose yields genuine integration (a new observer with its own irreducible perspective) versus mere aggregation (a collection that does not constitute a unified I)? This may connect to the integration axiom of IIT and the conditions under which $\phi > 0$.

The coupling constant. How strongly does collective Appetition actually alter the shared perceptual landscape? Is this a weak effect requiring enormous numbers of aligned observers, or a strong one? Answering this question would determine the empirical reach of the collective-intention implications discussed in §4.4.

Observer persistence and cessation. When Appetition ceases — in death, dissolution of a group, or collapse of a cultural form — the sustained Attend-Unfold cycle breaks. The Unfold degrades. A detailed dynamical account of how composite Unfolds braid, fray, and dissolve would extend the formalism into questions of identity persistence, mortality, and succession.

Non-commutativity of the operators. The distinction between Attend (Appetition ∘ Perception) and Unfold (Perception ∘ Appetition) rests on the non-commutativity of the two elementary operators. A full treatment should characterize the commutator [Appetition, Perception] and its physical interpretation — it may encode something fundamental about the relationship between the inward and outward faces of consciousness.

8 8 — Conclusion

We have proposed an algebra of composable observers built from one primitive entity — the Observer, defined as a minimal left ideal equipped with a Markov blanket — carrying two elementary operators: Perception (inward projection through the blanket) and Appetition (directed internal drive acting through the blanket). Three composite operations exhaust the algebra: Attend (Appetition ∘ Perception — the outside comes in), Unfold (Perception ∘ Appetition — the inside goes out), and Compose (mutual Attend between observers, generating a new observer).

The algebra is scale-invariant, substrate-independent, and consciousness-first. It recovers the inside-outside duality observed at every scale of nature as a structural consequence of the Markov blanket, derives observable reality as the explicate Unfold of a deeper enfolded order, and shows how coherence and pathology alike arise from the alignment or misalignment of appetitive drives within compositions.

The most striking feature of the framework is the role of the joint blanket in shaping shared reality. The joint blanket of a composed observer creates a consensus perceptual landscape — biasing but not determining what its constituents can perceive and therefore what they can attend to. This single mechanism accounts for cultural worldviews, for the efficacy of collective intention, for the possibility of parasitic manipulation, and for the emergence of apparently objective physical law from observer-relative consensus.

Observable reality, on this account, is neither illusion nor bedrock. It is the ongoing, collective, appetition-driven Unfold of composable observers — earned, sustained, and always open to revision through the participatory act of Attend.

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