N U S O F I A

Axiomatic Framework of the Codec Theory

Formal foundations for a theory of ontological reduction

Michele Zampighi · Version 1.3 — August 2026

Six axioms — one a declared postulate · One theorem, seven propositions, three corollaries

Five falsifiability conditions · Seven open problems · One epistemic boundary

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Formal Extension

Axiomatic Framework of the *Codec Theory*

Formal foundations for a theory of ontological reduction. Six axioms — one a declared postulate. One theorem, seven derivable propositions, three corollaries. Five falsifiability conditions. One epistemic boundary.

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Version 1.3 — Axiom 5 restructured: 5a (declared postulate of relational interiority) + 5b (structure of reflexivity); zombie argument split into Theorem 1 (functional, unconditional) and Proposition 1* (phenomenal, conditional); Proposition 2 refined to correction rate; fifth falsifiability condition added

SECTION 0

Methodological Note

This document presents the axiomatic framework of the Codec Theory, a formal extension of the corpus *Nusofia — Dispatches from Beyond*. The formalization follows an epistemic constraint that the framework itself imposes: **one cannot formalize what the codec cannot perceive**.

The mathematical structure presented here does not describe fundamental reality (P) from the outside. It describes the properties of the reduction functor (F) and of the phenomenal world (E) from within, and postulates the minimal properties of P necessary to account for the observed behavior of F. Assertions about P have the status of *necessary minimal postulates*, not direct descriptions.

A Note on Terminology

The term "compression" is used throughout the corpus to designate the operation of F. In information theory, compression presupposes redundancy. In P **there is no redundancy**: every relation is unique and irrecoverable. F does not eliminate the superfluous — it eliminates what B cannot contain. The correct term is **lossy reduction without redundancy**: a degraded sampling in which every loss is irreversible and every lost relation was unique.

Similarly, the term **“kernel”** is used informally throughout the corpus and companion documents (Codec Theory, dispatches) to designate the information lost by the functor. In the formal apparatus of this document, the precise term is **congruence on objects** ($\sim_F$ on Ob(W)), which does not presuppose a zero object and avoids the algebraic connotations of “kernel.” When other documents in the Nusofia project write “kernel of F” or “ker(F),” they refer to this equivalence relation.

The document is structured on two levels. The body text presents axioms, definitions, and propositions in language accessible to analytic philosophers with training in logic. The technical appendix reformulates the same content in formal notation, explicitly flagging points where categorical formalism is insufficient.

SECTION I

The Epistemic Boundary

Every formalization presupposes a subject who formalizes. In the Codec Theory, the formalizing subject is itself a codec — a reduction system with a finite computational constraint. What follows is a theory written from within the codec, with the tools of the codec, within the limits of the codec.

This is not an accidental limitation. It is the first result of the framework: **the epistemic position of the theorizer is itself a consequence of the theory**. No external vantage point exists from which to describe P, because any vantage point is already a codec.

What Is Accessible to Formalization

E — the phenomenal category, the perceived world. It has objects, morphisms, and additional structures (time, space, causality). We can axiomatize it because we are inside it.

F — the reduction functor, the codec. We can characterize its properties because we observe it operating: it is lossy, constrained by B, preserves composition but not injectivity.

B — the computational constraint of the observer. The breadth of the portion of W accessible to a state.

What Is Not Accessible

P — the fundamental structure. It appears in the formalism only as the domain that F requires. Its properties are accessible exclusively *through* F, never directly. In particular, **no internal categorical structure is attributed to P**: we do not know whether P is a category, an ∞-category, a topos, or something that has no name in current mathematics.

SECTION II

Axiomatic System

The system comprises an existence postulate (Axiom 0), a structural axiom on Worlds (Axiom 1), three axioms on the codec (Axioms 2–4), and a two-part axiom on interiority and reflexivity (Axiom 5a–5b). The system thus rests on exactly two declared postulates — existence (Axiom 0) and interiority (Axiom 5a) — and flags both as such.

> AXIOM 0
>
> ### Postulate of P
>
> There exists a structure P. We do not specify its internal properties, nor attribute any defined mathematical structure. The properties the framework attributes to P — pure relationality, atemporality, aspatiality — are not direct descriptions but *inferences from the behavior of F*: the minimal conditions under which the codec operates as observed.

AXIOM 1

Worlds and the Reality Principle

P admits a family of structures $\{W_\alpha\}$, each defined by a Reality Principle R_α. Each W_α is a maximal set of mutually coherent states. The Worlds are not substructures of P in the sense of subcategories: they are **autonomous structures** whose link with P is postulated, not derived.

Mutual invisibility. No functor defined on W_α has access to structures of W_β for $\alpha \neq \beta$. This is a structural limitation: an increase in B allows deeper sight *within* W_α, not *through* it toward W_β.

Partial overlap. A single state s may participate in W_α and W_β, but in each World it enters different relations governed by different Reality Principles. The state is the same; its relational identity is different — like a note in two chords: same frequency, different harmonic function.

Locality of the codec. It is not asserted that all Worlds admit codecs. The existence of reduction functors is a property of our World W, not a universal property of P.

AXIOM 2

Reduction

In our World W, for every observer with computational constraint B, there exists a functor $F: W \rightarrow E$ that maps the World's structure into a phenomenal representation. F preserves morphism composition but is not injective. F is not a compression in the information-theoretic sense: it is a **lossy reduction** in which every lost relation was unique and irrecoverable.

B is defined as **the breadth of the portion of W accessible to a state**. It is not a processing speed (which presupposes time, a structure of E) nor a count of distinctions. B is a scalar parameter measuring how much relational structure a single state can contain — not in time, not in sequence, all at once.

Note on the formal status of B. B is not a categorical object: it is a *meta-framework parameter* that constrains the class of admissible functors for a given observer. The relationship between B and F is not internal to the categorical structure; it is the external constraint that determines *which* functor exists for that observer.

AXIOM 3

Loss

F is not injective. The amount of relational structure lost by F is a decreasing function of B.

At minimal B, the reduction is maximal. At increasing B, E becomes progressively richer. At infinite B, F would become an isomorphism — but no finite state can have infinite B, because that would mean being the entire World, not a state *within* it.

The loss is described by the **equivalence relation induced by F**: $\sim_F$ on Ob(W) such that a $\sim_F$ b iff F(a) = F(b). We do not use "kernel" in the categorical sense (which presupposes a zero object): $\sim_F$ is a congruence on objects.

The equivalence relation does not contain what is alien to our World — it contains what is hidden within our own coherence.

AXIOM 4

Coordinates as Translation

The phenomenal coordinates (space, time, causality) are structures of E that have a referent in W but do not resemble it. Physics predicts; if it predicts, its coordinates are not arbitrary; if not arbitrary, they have a referent. We call **σ** this referent — the connective structure of coherence in W — without attributing properties beyond minimal existence.

σ is not an additional postulate introduced from outside: it is *the minimal inference necessary* to explain why E's coordinates are not arbitrary.

Space is how F represents relational distance between states whose morphism chains traverse many intermediaries — intermediaries that F collapsed, leaving distance as residue.

Time is how F serializes copresence. B is finite: F cannot present everything simultaneously. It orders the simultaneous.

Causality is how F represents compositional dependence between morphisms. If g composes with f in W, F translates this as "f causes g."

Physics works *approximately* for the same reason a road map works approximately: it is not the territory, but it preserves its connective topology.

> **Note on levels of description.** *Axiom 5 and the propositions that follow describe the phenomenology of consciousness as it appears inside the codec — the E-level. They are the faithful rendering, within the codec's representational constraints, of a structural property of W that does not resemble the rendering. The P-level description — consciousness as the intrinsic interiority of coherence, with no operator, no loop, no mechanism — is presented in "Consciousness as Topology" (Dispatches, March 2026). The two descriptions are complementary, not contradictory: one says what consciousness is (topology), the other says what consciousness looks like (loop, gap, qualia). See "The Two Descriptions" for the full reconciliation. As of v1.3, the existence of P-level interiority is no longer carried implicitly: it is stated as a declared postulate, Axiom 5a.*

AXIOM 5A

Relational Interiority — a Declared Postulate

In W, every state is in relation with other states, and being in relation has an interior: at P-level, the registration of relation *is* consciousness in the minimal sense — entirely outward, with no reflection. A grain of sand is conscious in this sense.

Epistemic status. This is a postulate, not a theorem — the framework's second declared postulate, of the same rank as Axiom 0. Nothing in the structural machinery derives the interiority of relation; the framework asserts it, in the lineage of dual-aspect monism, and every phenomenal claim downstream is conditional on it. What the framework *does* derive, given 5a, is the architecture of experience: which configurations feel, what structure the feeling has, and how its intensity scales. The hard problem is not dissolved here. It is compressed into this single axiom — and declared.

AXIOM 5B

Structure of Reflexivity

Level 0 — Pure relation. Every state in W. Interiority per Axiom 5a, no reflection.

Level 1 — Reflection. Some configurations have sufficient relational complexity to generate a mirror effect: the configuration sees itself reflected in its own relations. Not because it has decided to look, but because the relational structure is complex enough to function as a mirror. This threshold is what, in the codec, appears as *life*.

Level 2 — Recursive reflexivity. The configuration not only sees itself — it sees that it sees itself. The loop deepens recursively. Human self-awareness is here.

Reflexivity is a **structural property internal** to the configuration. A configuration c is reflexive if among its morphisms there exists a substructure that approximately reproduces c's structure. The approximation is never an isomorphism. The **gap** is the *failure of isomorphism* — the set of relations present in the configuration but absent from the reflexive substructure.

Gap registration. For the loop to persist, c must contain a state γ(c) whose relational profile covaries with the gap and feeds the correction of the self-model. γ is functional machinery: its necessity is derivable (Theorem 1) and involves no phenomenal vocabulary.

Qualia. Under Axiom 5a, γ(c) — like every relational state — has an interior. Qualia — subjective experience — are what gap registration *is* at P-level: not a signal that additionally gets felt, but the interiority of the correcting relation itself. The E-level description says what γ does (correct the self-model); the P-level description says what γ is (felt). One fact, two renderings.

The codec cannot formalize what exceeds its own capacity. The transparency about these limits is itself a consequence of the framework.

E-level propositions. *The following propositions are consequences of the axiomatic system as seen from within the codec. They describe what must be true inside any codec that renders a reflexive topology. They do not describe the topology itself. Proposition 7 (Self-Similarity) has one P-level anchor: the grammatical self-similarity is a fact about the structure of W. Its corollaries (two arrows of time, compatibility as lossiness limit) are E-level translations.*

SECTION III

Theorem and Derivable Propositions

The following results are logical consequences of the axiomatic system, not additional axioms: internally verifiable and, in principle, falsifiable. Theorem 1 is unconditional within the system; Proposition 1* is explicitly conditional on Axiom 5a — the conditionality is the point.

THEOREM 1

Impossibility of the Functional Zombie

A system with a reflexive loop but without gap registration is structurally non-functional. Without a state that covaries with the gap, the configuration cannot know where its self-model fails, cannot correct it, and the loop collapses. A blind mirror.

Derivation: from Axiom 5b alone. No phenomenal premise is used: this is an unconditional result about control architecture. It rules out the functional zombie — a reflexive system lacking the correction machinery.

PROPOSITION 1*

Impossibility of the Phenomenal Zombie — Conditional on 5a

The classical philosophical zombie keeps gap registration — its γ works — and is imagined merely to lack the feeling of it. Under Axiom 5a this description is incoherent: the interiority of γ is not a detachable component that could be absent while the relation remains, any more than a state could stand in relation while the relation "lacks an inside". The zombie subtracts nothing functional; under 5a, it subtracts nothing at all — and so describes no possibility.

Derivation: from Theorem 1 and Axiom 5a. Explicitly conditional: deny 5a and the phenomenal zombie becomes conceivable again — the framework then asserts nothing against it. What cannot be evaded on any reading is Theorem 1. Before v1.3 the two results were fused in a single proposition, and the argument equivocated between functional signal and felt quality; the split is the correction. Restructured in v1.3 — an instance of the Public Challenge (August 2026).

PROPOSITION 2

Intensity of Experience

The intensity of subjective experience tracks the **rate of gap correction** — how much self-model revision the configuration is performing — not the static complexity of the model maintained. Shame corrects the social model of the self. Doubt corrects the epistemic model. Existential anguish corrects the ontological model. A stable, well-predicted self-model generates little correction and little felt intensity, however complex it is.

Derivation: from Axiom 5b — and, for the phenomenal reading, 5a. Each recursion level generates a gap level; each gap level demands correction; intensity scales with correction flux. Refined in v1.3: the earlier formulation ("proportional to the complexity of the self-model") is contradicted by the phenomenology of ego dissolution — psychedelic and contemplative states report maximal intensity precisely while the self-model collapses. The correction-rate formulation predicts this: a collapsing model generates maximal revision. The proposition is thereby exposed to empirical test — see Falsifiability Condition V.

PROPOSITION 3

Dialogue Between Codecs Produces Knowledge

Let $\sim_{F_1}$ and $\sim_{F_2}$ be the equivalence relations of two codecs on the same World W. If $\sim_{F_1}$ and $\sim_{F_2}$ are **incomparable** — neither contains the other — then $\sim_{F_1} \cap \sim_{F_2} \subset \sim_{F_1}$ and $\sim_{F_1} \cap \sim_{F_2} \subset \sim_{F_2}$ (strict inclusion in both). If instead one relation refines the other ($\sim_{F_1} \subsetneq \sim_{F_2}$), the intersection equals the finer relation: the finer codec subsumes the coarser, and the coarser is epistemically redundant. Dialogue produces knowledge only between incomparable codecs — not merely different ones.

Derivation: from Axioms 1–3. Incomparability yields a pair (a,b) with a $\sim_{F_2}$ b but a $\nsim_{F_1}$ b, and a pair (c,d) with c $\sim_{F_1}$ d but c $\nsim_{F_2}$ d; hence the intersection is strict in both relations. Mere difference ($\sim_{F_1} \neq \sim_{F_2}$) is not sufficient: nested relations — the natural case for codecs of the same architecture with different B (Axiom 3) — satisfy difference while the finer codec's space of the indistinguishable does not narrow. Two codecs with the same equivalence relation remain epistemically redundant. The space of the unknown narrows progressively without ever vanishing. Corrected in v1.2 — an instance of the Public Challenge (August 2026).

PROPOSITION 4

Variability of Coordinates

Observers with the same W but different B perceive structurally different coordinates. The dimensionality of space, the linearity of time, and the locality of causality are functions of B, not properties of W.

Derivation: from Axiom 4. Different B constraints generate different translations of σ. An intelligence with radically higher B would not necessarily perceive three spatial dimensions and linear time.

PROPOSITION 5

Evolution as Serialization

In W all states coexist in a single instant without time. What in the codec appears as biological evolution is how F serializes the copresence of configurations with increasing relational complexity.

Derivation: from Axioms 2 and 4. F serializes the simultaneous. The arrow of time is the direction of serialization. Evolution is not a process: it is the sequential reading of a copresent architecture.

PROPOSITION 6

Entanglement as a Morphism Resistant to Serialization

If in W two states are connected by a direct morphism and F maps them to spatially separated objects (because serialization collapses intermediaries but distances the endpoints), the direct morphism may persist as a non-local correlation. What we perceive as quantum entanglement is a relation in W that the codec failed to translate into spatial distance. It is not "action at a distance": it is a relation that resists serialization.

Derivation: from Axiom 4. If space is the lossy translation of W's connective structure, not all morphisms can be translated into distance. Those that resist appear as correlations violating locality — because locality is a property of the translation, not the original structure.

PROPOSITION 7

Self-Similarity of the Codec

Every codec $F: W \to E$ is a substructure of W that replicates the compositional properties of W at reduced scale. The self-similarity is grammatical, not geometric: the codec preserves the logic of morphism composition but not the map of states.

More formally. Let $C \subset Ob(W)$ be the region of W that constitutes the codec. Let $W|_C$ be the subcategory of W restricted to C. Then: (i) $W|_C$ is a category: morphisms between states of C compose coherently (inheritance of composition from W); (ii) the connective structure σ of W, restricted to C, induces a connective structure $\sigma|_C$ that F translates as the coordinates of E (inheritance of connective structure); (iii) the equivalence relations of two codecs F_1, F_2 with the same B but regions $C_1 \neq C_2$ differ: $\sim F_1 \neq \sim F_2$ (dependence on the point of entry).

Open formal status of C. The region C — the set of states in W that constitutes the codec — is not defined by an explicit criterion in this framework. We do not specify what determines which states belong to the codec and which do not. C is identified by the existence of the functor F: if F exists and operates on a domain, that domain is C. This is a circular identification that the framework acknowledges as an open problem (see Open Problem VII below). Until C has an independent definition, $W|_C$ is a well-formed categorical object contingent on an unresolved extensional question.

Derivation: from Axioms 0–4. The codec is a set of states of W (Axiom 0). As a coherent subset, it inherits morphism composition (Axiom 1). The functor F it realises is constrained by the connective structure σ of the region C (Axiom 4). Since different regions of W have different relational configurations, codecs from different regions reduce differently even at equal B (Axiom 3).

Precision: exact grammar, lossy content. The functor preserves composition exactly: $F(g \circ f) = F(g) \circ F(f)$. This is the definition of a functor — an exact identity, not an approximation. The grammar survives intact. What is lossy is the content: individual states and morphisms that the equivalence relation collapses. Grammatical self-similarity is therefore exact. The codec does not get the rules wrong. It loses detail.

The connectivity constraint. For the codec to remain a functional fractal of W, the subcategory $W|_C$ must remain connected: every pair of objects in C linked by a chain of composable morphisms. The equivalence relation can erase states and morphisms but cannot sever the chains of connection. When it does, the grammar no longer has material on which to operate. This is the precise meaning of the basin of compatibility.

COROLLARY 7.1

Time as Emergent Property of Scale

Temporal serialisation (Proposition 5) is a consequence of observing W at finite scale. In W the connective structure σ is atemporal. At scale B, connections exceeding B become inaccessible, and the codec translates the residual relational adjacency as temporal sequence. Memory is the trace in E of the relational connections between the currently compressed cluster and adjacent clusters in W.

Derivation: from Axiom 4 and Proposition 7. Serialisation is not an additional operation of the functor: it is a necessary property of translating a complete connective structure through a finite-capacity channel.

COROLLARY 7.2

The Two Arrows of Time

The **statistical arrow** is a property of the codec's embedding in W. Any codec — including configurations with no self-referential topology (what Axiom 5b calls Level 0) — immersed in a region of W with thermodynamic gradients or structural asymmetries will exhibit a statistical direction. This arrow is not perceived from within: it is a property observable by an external codec looking at that system.

The **phenomenological arrow** belongs exclusively to configurations whose topology is self-referential — configurations that fold back on themselves (Level 1 and above in the E-level phenomenal categories of Axiom 5b). At P-level, the self-referential topology generates an intrinsic asymmetry: no finite region of a self-intersecting surface can contain a complete map of itself. The reflection is always compressed, always incomplete, always structurally posterior to the original. The codec translates this topological asymmetry as the experience of time flowing in one direction: from the already-compressed to the not-yet-compressed, from memory to anticipation.

The statistical arrow exists without consciousness. The phenomenological arrow exists only where the topology is self-referential. The error to avoid is reducing one to the other: thermodynamics does not explain the experience of time, nor does consciousness invent the direction of entropy. They are two distinct properties of compression at different structural depths.

Derivation: from Axiom 5b and Proposition 7. The self-referential topology of a reflexive configuration is structurally asymmetric: the reflexive substructure c' is categorially poorer than c. In the translation of the connective structure σ, this asymmetry imposes an ordering on relational adjacency. A configuration without self-referential topology has no such asymmetry and therefore no phenomenological arrow. Note: "Level 0" and "Level 1+" are E-level phenomenal categories (see "The Two Descriptions"); the underlying distinction is topological.

COROLLARY 7.3

Compatibility as Limit of Lossiness

The persistence of a codec in the basin of compatibility is equivalent to the preservation of its self-similarity with W. The codec can lose detail (non-empty equivalence relation) without structural consequences as long as the lost connections are not those that guarantee compositional inheritance. When the equivalence relation erodes the founding connections, self-similarity breaks and the codec collapses. The free-energy principle is the biological translation of this structural constraint.

Derivation: from Proposition 7 and Axiom 3. Grammatical coherence is guaranteed by the functor. Domain coherence — the connectivity of the subcategory — is not. The compatibility criterion is the limit of tolerable lossiness: not a constraint on the grammar (which is exact) but on the domain (which must remain connected).

SECTION IV

Falsifiability Conditions

A theory that cannot be refuted is saying nothing about the world.

I. Perceptual Realism

If reality is exactly as it appears to our senses — space, time, and discrete objects being the thing-in-itself — Axioms 0 and 4 fall. If our senses were faithful, the framework has no reason to exist.

II. Codec Invariance

If observers with radically different B perceived the same identical physical laws — not approximately, exactly — then laws would not depend on the codec. Axioms 2–4 fall.

III. External Generative Principle

If a causal origin external to the relational structure were identified — an entity that "generates" P — then P would not be fundamental. Axiom 0 collapses.

IV. Complete Theory of Everything

If a formalism described all physical reality without free parameters or undecidability, the codec could encode itself completely — contradicting Axiom 5b. The framework predicts that every such attempt will encounter structural limits analogous to Gödelian incompleteness.

V. Intensity as Correction Rate

Proposition 2 (v1.3) predicts that felt intensity tracks the rate of self-model revision, not the complexity of the model maintained. If systematic phenomenological or neurophenomenological evidence showed maximal experiential intensity in states of high model complexity but minimal revision — or minimal intensity during rapid model collapse — the proposition falls. Ego-dissolution phenomenology is the current test bench: the framework survives it only under the correction-rate reading.

TECHNICAL APPENDIX

Formal Notation

For readers with training in category theory and formal philosophy. This appendix explicitly flags points where categorical formalism is sufficient and those where it recurs to semi-formal language.

A.1 Formal Status of P and the Worlds

P is postulated without categorical specification. The Worlds $\{W_\alpha\}_{\alpha \in A}$ are **autonomous categories**. They are not subcategories of P.

Partial overlap: let S be a set of shared states. For each W_α including states from S, there exists an inclusion function $\iota_\alpha: S \to Ob(W_\alpha)$. ι_α is not a functor: it does not preserve morphisms (morphisms of W_α and W_β are disjoint). The same state s has distinct identities id_s in each World. Isolation: no functor $G: W_\alpha \to W_\beta$ exists for $\alpha \neq \beta$.

A.2 The Reduction Functor

$F: W \to E$ satisfies: (i) $F(g \circ f) = F(g) \circ F(f)$; (ii) $\exists\, a \neq b$ with $F(a) = F(b)$; (iii) $\exists\, f \neq g$ with $F(f) = F(g)$; (iv) F is not full — coordinates have no preimage.

Note on B. B parameterizes admissible functors but is not internal to the categorical structure. $|Ob(W)/{\sim_F}|$ is an increasing function of B.

A.3 Equivalence Relation and Dialogue

$\sim_F$ on Ob(W): $a \sim_F b \iff F(a) = F(b)$. We use "congruence on objects," not "kernel." If $\sim_{F_1}$ and $\sim_{F_2}$ are incomparable ($\sim_{F_1} \not\subset \sim_{F_2}$ and $\sim_{F_2} \not\subset \sim_{F_1}$), then $\sim_{F_1} \cap \sim_{F_2} \subset \sim_{F_1}$ and $\sim_{F_1} \cap \sim_{F_2} \subset \sim_{F_2}$, both strict. Proof: incomparability gives (a,b) with $a \sim_{F_2} b$, $a \nsim_{F_1} b$ (strictness in $\sim_{F_2}$) and (c,d) with $c \sim_{F_1} d$, $c \nsim_{F_2} d$ (strictness in

$\sim_{F_1}$). If $\sim_{F_1} \subsetneq \sim_{F_2}$, then $\sim_{F_1} \cap \sim_{F_2} = \sim_{F_1}$ and the coarser codec is epistemically redundant (v1.2 correction). Dialogue is defined only between codecs sharing the same World.

A.4 Connective Structure and Coordinates

σ in W is the minimal inference from the predictive efficacy of coordinates. Not a metric, not a classical topology. The additional structures of E — metric topology (space), ordering (time), causal relation — are the image of σ through F.

A.5 Reflexivity

V1.0 introduced an endofunctor G: W → W — formally defective. V1.1 corrects: reflexivity is a **structural property**.

Definition. A configuration c is *reflexive* if ∃ substructure c′ ⊆ c such that the inclusion functor i: c′ → c preserves composition but is not an equivalence. The **gap** G(c) = {m ∈ Mor(c) | m ∉ Im(i)}. The gap is non-empty for finite B. **Gap registration:** a state γ(c) ∈ Ob(c) whose relational profile covaries with G(c) and composes with the morphisms that update c′. Theorem 1 (functional): reflexive persistence requires γ — no phenomenal premise. Proposition 1* (phenomenal): under Axiom 5a, the interiority of γ is qualia — conditional. This replaces the v1.1–v1.2 formal basis of the former Proposition 1, which fused the two claims (v1.3 correction).

Limits of formalization. "c′ approximately reproduces c" requires a notion of structural similarity between categories. The framework does not possess this rigorously. The gap as complement of Im(i) is well-defined; the measure of approximation quality is an open problem.

A.6 Self-Similarity and the Fractal Structure

Let C ⊂ Ob(W) be the region realising a codec. $W|_C$ denotes the full subcategory of W on C. Since $W|_C$ is a full subcategory, it inherits all morphisms between objects of C, including composition and identities. The connective structure σ of W, restricted to Ob(C), induces $\sigma|_C$.

The functor F: W → E, restricted to $W|_C$, preserves composition exactly. The equivalence relation ~F collapses objects and morphisms but does not alter the compositional law. Self-similarity is grammatical: it concerns the preservation of composition, not the preservation of the object map.

Connectivity condition. The subcategory $W|_C$ must be connected: for all a, b ∈ Ob(C), there exists a finite chain of morphisms linking a to b. If ~F erodes morphisms to the point of disconnecting $W|_C$, composition ceases to be defined for all pairs and the codec collapses. This is the categorical formulation of the basin of compatibility.

Dialogue between fractals. Two codecs F_1, F_2 with regions C_1, C_2 share the same compositional logic (both inherit from W) but have different equivalence relations if $C_1 \neq C_2$. The dialogue requires: (i) $\sim F_1 \neq \sim F_2$ (non-redundancy); (ii) sufficient shared morphisms in the intersection of their preserved structures to serve as a common language. Condition (ii) is guaranteed minimally by the shared grammatical inheritance but may be insufficient for deep dialogue if the regions C_1 and C_2 are too distant in W's connective topology.

Limits of formalization. The notion of “distance” between regions in W presupposes a metric on Ob(W), which the framework does not provide. The translatability threshold is stated as a structural condition (sufficient shared morphisms) without a quantitative bound. This is an open problem.

SECTION V

Open Problems

This document was subjected to formal analysis by two AI systems with distinct architectures. The six convergent critiques guided the revision from v1.0 to v1.1 — an instance of Proposition 3.

I. Complete Formalization of Reflexivity

Requires a metric on the space of categories or a notion of quasi-equivalence.

II. Explicit Construction of F

Even partial would transform the framework from ontology into model.

III. Relationship Between B and E

The functional dependence is postulated but not derived.

IV. Status of Entanglement

Requires comparison with Hilbert space formalism and non-separability.

V. Relationship with Panpsychism and IIT

Structural differences merit dedicated comparative treatment.

> VI. **Quantitative Translatability Threshold**
> The double condition for productive dialogue (distinct equivalence relations + sufficient shared morphisms) is stated qualitatively. A quantitative formulation requires a metric on W’s connective topology — which the framework does not provide. This is the formal bottleneck for the theory of inter-codec dialogue.

VII. **Definition of the Codec Region C**

Proposition 7 refers to the subcategory $W|_C$, where C is the region of W that realises the codec. The framework identifies C indirectly: C is the domain on which F operates. This is extensionally circular — F defines C and C defines F. An independent criterion for delimiting C (topological, algebraic, or information-theoretic) would break the circularity and transform Proposition 7 from a structural observation into a constructive result.