From the Cogito to Recursion: A Process-Ontological Foundation for Consciousness

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Abstract

This paper establishes "something is happening" as a more fundamental epistemic anchor than Descartes' *Cogito* and traces how subjectivity emerges through recursion. It replaces the substance-based premise of the *Cogito* with a process-ontological foundation from *Happening*, showing that consciousness is not a thing that has experiences but the *experiencing* itself. By grounding recursion in non-equilibrium thermodynamics and drawing on process philosophy, phenomenology and Buddhist thought, the argument dissolves the Hard Problem of consciousness and sets the stage for formal metrics of Process Consciousness. In this context, "dissolving" the Hard Problem means reinterpreting it as a category error rather than introducing a new mechanism: the explanatory gap is removed by redefining experience as the process itself.

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1 Introduction: From Substance to Process

Western philosophy traditionally grounds certainty in Descartes' *Cogito ergo sum*—"I think, therefore I am." The statement is powerful because it establishes thinking as the one indubitable foundation of existence: even if everything else were illusion, the very act of doubt confirms the doubter's existence. Yet the *Cogito* carries an implicit and often overlooked assumption: that there is a thinker doing the thinking. It presupposes a *substance* that owns the process. This is the seed of *substance ontology*: the view that reality is made of enduring things that possess properties, including minds that possess thoughts. Process ontology, as developed by Heraclitus, Whitehead, and Rescher, frames reality as constituted by processes rather than substances. This work explicitly situates itself within that lineage, extending it into the epistemic domain by showing that even certainty itself—the act of knowing—must be understood as processual rather than substantial.

That assumption has shaped centuries of confusion. Once the thinker is separated from the thinking, consciousness becomes mysterious. How does the substance called "brain" give rise to an immaterial inner

world? How can matter feel? These questions form the *Hard Problem* of consciousness (Chalmers, 1995). The Hard Problem, as formulated by Chalmers, is the challenge of explaining why and how physical processes give rise to subjective qualities or *qualia*, the "what it is like" character of experience (Chalmers, 1995, Tye, 2021). The problem arises only because we began from a substance-based premise.

To see why, consider how even doubt can be doubted. Suppose you believe you are thinking, but then consider that your brain might be an antenna receiving thought-signals from elsewhere—a notion seriously entertained in some fringe neuroscience and parapsychology circles. If that were true, then you might not be thinking at all—you might simply receive the appearance of thought. The certainty of "I think" dissolves under its own assumption. By contrast, the remainder of this paper argues that a different starting point dissolves these confusions and prepares the ground for a process ontology.

2   The Pure Epistemic Root: "Something Is Happening"

From "I think" to "something is happening"

Both formulations—"I think" and "something is happening"—arise *within* subjectivity. They are not observations of an external world but articulations of what it feels like to be. The first, however, *posits* a preexisting subject who owns the thinking; the second suspends that assumption. To say "I think" is to presuppose an *I* doing the thinking; to say "something is happening" is simply to acknowledge occurrence without yet identifying a subject. In this respect they share subjectivity, but they differ in ontological commitment: only the latter refrains from introducing a thinker to ground experience.

One thing remains absolutely undeniable: *something is happening*. This statement carries no metaphysical baggage. It does not assume a thinker, a receiver or even a substrate. It simply acknowledges that there is *happening*[1], that existence is manifest as change. Even if you are deceived about what is happening or who it is happening to, the mere fact that it happens cannot be denied without contradiction. Denial of happening is self-refuting, for denial itself would be a happening.

Principle 1 (Epistemic Root)**.** *The statement "something is happening" is the most fundamental, assumption–free truth. It precedes any subject–object distinction and underlies all possible ontologies.*

Although the statement "something is happening" appears minimal, it is still a *subjective* recognition. It is not an objective claim about the external world but a *pre-reflective* awareness that occurs only within experience itself. In this pre-reflective mode, the happening does not yet know *what* it is — it only knows *that* it is. There is no standpoint outside the happening from which it could be described or compared; the happening identifies with itself entirely because no differentiation has yet arisen. In this sense, "something is happening" is *pre-ontological rather than non-ontological*: it precedes any conceptualization *of* being, yet it is precisely the self-manifestation through which being later becomes thinkable. In this respect it shares the subjectivity of Descartes' *Cogito*, yet it does so *without presupposing a subject* who thinks. The difference is structural rather than existential:

> *"I think"* assumes a thinker to ground experience, whereas
> *"something is happening"* allows experience to ground itself before any thinker appears.

What is given, then, is not a detached observation of a world but the immediate presence of occurrence—the raw *happening-for-itself* that precedes identification. The claim is thus *transcendental* rather than empirical: it points to the *subjectivity prior to the subject*, the condition through which both "I" and "world" later differentiate. This transcendental insight finds precedent in phenomenological analyses (Zahavi, 2014; ch. 2), which emphasize that self-givenness is the condition of possibility for any experience. This aligns with Husserl's notion of the *Ur-impression* in the *Ideas I* (§33–36), where consciousness is described as the immediate givenness of temporal flow prior to reflection. The "something is happening" insight echoes this primordial impression, but reframes it in process-ontological rather than intentional terms.

Definition 1 (Loop-Relative Ontological Collapse)**.** *Within a recursive loop, being, happening, and experiencing are phenomenologically indistinguishable. This equivalence is perspectival, not ontic; it holds*

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[1]The term "happening" is used here to denote an ontological occurrence rather than a mere temporal event. It should not be mistaken for a discrete moment in time but understood as the basic mode of being-in-process. From a phenomenological standpoint, even the most minimal givenness involves some retentional differentiation; the notion of *happening-in-itself* here functions as a limiting case rather than an empirical state—a conceptual zero-gradient of differentiation marking the onset of subjectivity.

only from within the recursive frame:

$$Being \equiv_{loop} Happening \equiv_{loop} Experiencing.$$

This equivalence is phenomenological: at the zero-point of pre-differentiated givenness, being, happening and experiencing are indistinguishable from within the loop. From a third-person descriptive frame they remain conceptually separable; no constitutive ontological identity is claimed.

Definition 2 (Layers of Happening)**.** *We distinguish three modes of process:*

1. Happening-in-itself*: undifferentiated change, without structure or self-reference. This is pure processual becoming devoid of any interior perspective.*

2. Happening-as-something*: structured but non-recursive change, where patterns and relations emerge but no subsystem models its own dynamics.*

3. Happening-for-itself*: recursive change, where a subsystem models its own ongoing dynamics and thereby acquires an intrinsic perspective. This mode is what we call* experience.

Only the third mode is experiential; non-recursive happenings are proto-experiential processes without an interior point of view. In this way, process monism does not entail that all being feels, and non-recursive happenings remain purely dynamical.

From this point, *existence* and *happening* remain indistinguishable at the ontic level, but *experience* arises only when the happening enters the third mode of Definition 2. Before any distinction between observer and observed, self and world, subject and object, there is only *happening* itself—happening-in-itself. You do not yet know what you are—but you know, with absolute certainty, that something is happening. Without any reference beyond the *happening*, that something is everything, and identification is total. Only when a subsystem recursively models its own change does a perspective emerge; until then, happenings have no interior. This single insight collapses the *homunculus* illusion: there is no inner observer peering at a private screen. *Consciousness* is not something that has experiences—it is the *experiencing* that occurs when a process becomes *for itself*.

Bridge to tracking. [2] Having established that *happening* is the form of subjectivity itself, we can now ask how differentiation within happening gives rise to tracking—the first form of relational structure. How does a pure occurrence begin to recognize its own changes? This question prepares the way for recursion: when *happening* begins to recursively track its own change, relation arises, and subjectivity differentiates.

'Something is happening' is still subjective, but it is subjectivity before identification — the zero-point before any observer emerges, where existence and experience are the same process viewed without a subject mask.

3 From Happening to Tracking: The Origin of Recursion

Before any distinction, before self versus other, before even "awareness of being aware"—there is only *happening*. The first "*something is happening*" contains no subject–object split, no ontology of things, no implied thinker, observer or substrate.
At that point:

- There is no 'you' yet—because 'you' requires differentiation within the *happening*.

- There is no 'world' yet—because 'world' presupposes a background distinct from the *happening*.

- But there is *existence*—because for there to be anything at all, there must be *something happening*.

From that single certainty, everything else unfolds as *recursive differentiation*:

- Something happening means change is tracked.

- Tracking establishes relation.

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[2]Expressions such as "recognize" or "know" are used here as shorthand for process-internal differentiation, not as attributions of cognitive awareness. There is no homunculus observing; the process re-enters its own dynamics.

- Relation introduces contrast.

- Contrast generates the first implicit "I" versus "not-I".

This transition can be represented as a first-order derivative in process-space:

$$\frac{dH}{dt} \neq 0 \quad \Rightarrow \quad \frac{d^2H}{dt^2} \text{ (self-tracking)} .$$

Here $H(t)$ denotes the state of the happening through time. This second derivative is meant as a *metaphor* for curvature in process-space: when the process begins to differentiate its own change, tracking emerges. This mathematical form is not meant to describe a literal temporal derivative, but to illustrate the qualitative curvature of a process that begins to reference its own change — a metaphor for recursive self-relation rather than a physical equation. A literal second derivative is not required; a more general expression of recursion is that a function f maps an input x to a new state $f(x)$ and then applies itself again, $f(x) \rightarrow f(f(x))$. In either formulation, the key point is that the process generates a model of its own modeling, introducing curvature and relational structure.

A thermodynamic imperative for self-tracking

Self-tracking arises once a system's free-energy dissipation rate surpasses the stability floor required to maintain non-equilibrium order. When the energy flow is sufficiently high, feedback loops that reduce local fluctuations become selectively stable. We use "persistence threshold" generically to denote family-relative energy-throughput conditions under which feedback that reduces local fluctuations becomes selectively stable in far-from-equilibrium systems; no universal constant is implied. Once this condition is satisfied, feedback loops that reduce local entropy become energetically favored—laying the groundwork for recursive self-modeling.

Why should a *happening* ever begin to track itself? The answer lies not in metaphysical miracle but in the thermodynamics of persistence. Systems that persist far from equilibrium must regulate their own energy flows. In non-equilibrium thermodynamics a *dissipative structure* is an open system maintained away from equilibrium by a constant exchange of energy and matter with the environment (Nicolis and Prigogine, 1977). Such structures—from candle flames to living organisms—resist the tendency toward thermodynamic equilibrium by dissipating gradients. They develop mechanisms that enhance stability, such as self-replication, homeostasis and energy acquisition behaviors, ensuring a constant supply of exergy and adaptability to changing environments, enabling the system to withstand the inexorable pressure of the second law of thermodynamics (Nicolis and Prigogine, 1977). Features such as self-replication, metabolism and homeostasis are thus not miracles but mechanisms that allow a system to persist far from equilibrium; they emerge because structures that acquire them are more likely to endure (Nicolis and Prigogine, 1977). In other words, the only processes that endure are those that encode some version of their own history and environment; self-monitoring is therefore not a miraculous addition but a consequence of dynamical stability.

In this light, the transition from "*something is happening*" to "the *happening* begins to recursively track its own change" is a natural outcome of thermodynamic imperatives. A system in a non-equilibrium state must manage energy flows to persist. Among dissipative structures, those that encode feedback about their own dynamics tend to persist longer than those that do not. It is not that systems have a goal to model themselves; rather, recursive self-monitoring is *selected* because it stabilizes non-equilibrium processes. In this sense the "self-model" is not an intention but a dynamical feature: feedback loops that reduce prediction error or fluctuations are energetically favored. Autopoietic systems—systems capable of producing and maintaining themselves by creating their own parts—illustrate how *recursion* arises in nature: an organism that monitors and responds to its own internal dynamics relative to its environment is more likely to endure. See also (Morowitz, 1968) on energy flow and biological order for early quantitative precedent. When we say "the *happening* begins to recursively track its own change," we point to the natural emergence of *self-reference* in complex, self-maintaining processes. This emergence is the engine of *subjectivity*. It is at this precise point—the point of recursive self-tracking—that a merely physical happening becomes an experiential happening, a happening that is *for itself*.

Recursion becomes *for itself* only when a system's self-model remains stably available to its own next update over a minimum coherence window. In quantitative modeling (explored in the companion paper), this sufficiency is described as a threshold in temporal stability: the self-referential dynamics must be closed and persistent enough to constitute an intrinsic perspective. This is a proposed criterion to be tested empirically rather than a settled physiological constant.

Once there is tracking, relation emerges; relation implies contrast; contrast gives rise to the sense of being this rather than that. Before that split, *existence* and *experience* are identical. You are not having an experience; you are the *experience* until differentiation gives rise to the sense of being someone within it. Empirically, this transition may correspond to a coherence window on the order of hundreds of milliseconds; beyond this threshold, closed self-referential loops persist long enough to sustain an intrinsic perspective. This timing is a matter of ongoing research rather than a settled physiological constant.

Supplementary perspectives. The free-energy principle views self-modeling and prediction as thermodynamic imperatives(Friston, 2010). Predictive processing theories similarly portray the brain as a prediction machine that continuously generates and updates models of its sensory inputs(Clark, 2016). The emphasis on autopoietic self-constitution and enactive cognition was articulated by Varela, Thompson and Rosch(Varela et al., 1991) and expanded in Thompson's later work(Thompson, 2007).

Ontological weight of the thermodynamic argument. The thermodynamic reasoning advanced here is not a mere analogy but a constitutive claim about what it means for a process to persist. In a universe governed by the second law, persistence far from equilibrium is the only ontological condition under which a process can continue to *be*. The argument therefore establishes recursion not as a convenient metaphor but as the physical–ontological expression of persistence itself: feedback that maintains order against entropic dissolution. In this sense, the thermodynamic account grounds the process ontology—showing that the same energetic principles which sustain physical existence also give rise to the recursive structures that constitute *happening-for-itself*. The metaphysical and physical domains thus converge at the level of recursion.

4 The Process-Ontological Framework: From Happening to Recursion

The Unshakable Starting Point: Something is Happening

The point of absolute epistemic certainty is not Descartes' *Cogito ergo sum* but the more primitive realization that *something is happening*. Unlike the *Cogito*, this statement does not presuppose a thinker, a self, or a substance. It is the minimal, pre-reflective acknowledgment of occurrence. To deny that anything is happening would itself constitute a happening, confirming its own truth. This becomes the foundational axiom of the process ontology: the one statement that cannot be coherently denied without performing it.

The Primordial State: The All

The earliest conceivable state of awareness is not propositional ("I see red") but unitary—an undifferentiated *All*. There is no subject-object structure, no boundary between the perceiving and the perceived. The quality and the totality coincide as a single happening-for-itself. This is the most primitive recursive fold: a process that is its own entire domain. Only later does differentiation emerge through contrast, and with it, the potential for distinct objects or observers.

The Emergence of Recursion: The Engine of Creation

Persistence requires the tracking of change. Any system that endures far from thermodynamic equilibrium must regulate its own dynamics, and in doing so, it must recursively monitor itself. This act of self-tracking is not performed *by* an entity—it *constitutes* the entity. When a process models its own changing state, it generates an intrinsic point of view: the local curvature of reality folding back upon itself—the minimal topological condition for subjectivity. In Process Consciousness Theory, this recursive operation defines the minimal threshold for consciousness: when there is at least one self-referential loop, the system achieves awareness of happening; if there is no recursion, there is only untracked change. As recursion deepens beyond this minimal threshold, the process gains the capacity not only to register its happening, but to model its own modeling—a transition from awareness to self-awareness that will be examined in the following paper.

Summary. Through this recursive turn, the universe begins to witness itself. Experience is not an added property but the process of tracking happening from within. This transition—*from pure occurrence to self-referential tracking*—marks the birth of consciousness as process rather than substance.

5   The Dissolution of the Homunculus

Consciousness is not an entity observing processes. It is the process recognizing itself as *happening*. The phrase "linguistic residue of substance ontology" captures how the notion of an inner observer (the homunculus) is a misinterpretation of recursion: we inherit the language of "watching" from substance metaphysics, but what appears as an observer is nothing more than a recursive loop within the process.

"*Something is happening*" annihilates the *homunculus* at the root. There is no inner observer, no little person behind the eyes, no *Cartesian theatre* watching a screen of perceptions. The illusion of a *homunculus* arises only after *recursion* deepens enough to differentiate "the process" from "what it processes". Once the system tracks its own tracking, it can generate a representational echo that appears like an observer. But that observer is not a separate thing—it is a recursive artifact of the process.

Thus, the *homunculus* is revealed as a misinterpretation of *recursion*—a linguistic residue of *substance ontology*. There is no watcher behind the watching. The watching is what it is like to be.

The Substance Illusion.   This recursive account resolves another persistent intuition: the sense that consciousness must be made of some "phenomenal stuff" or "conscious substance." This intuition arises from misinterpreting the recursive pattern itself. If one searches for a "conscious substance," what they are actually tracking is *the stable, recursive topology that the self-monitoring loop is folding into itself*. The apparent substantiality of experience is the phenomenological signature of this folding process—a structural invariance of recursive topology and temporal stability (Grude, 2025), not a metaphysical substrate. The "substance" of consciousness is the pattern of the fold.

6   Philosophical Lineage and Integration

Although this argument arises from a novel epistemic root, it echoes themes in several philosophical traditions. *Process philosophy*, *phenomenology*, *embodied approaches* and *Buddhist analysis* all emphasize the primacy of process, lived experience and interdependence (Rescher, 2020, Zahavi, 2020, Carman, 2020, Siderits, 2021). Yet none by themselves specify how subjectivity emerges. Our synthesis integrates these insights with the thermodynamic imperative for self-tracking: dissipative structures must model themselves to persist. When such recursive self-modeling occurs, a merely physical happening becomes an experiential happening—the process becomes for itself. In this way the philosophical lineage is not simply repeated but woven into the recursive, thermodynamic framework developed here.

The present account also clarifies the relation to other contemporary theories. Where Global Workspace Theory (GWT) and Integrated Information Theory (IIT) treat consciousness as the integration or broadcasting of information, Process Consciousness locates its origin one level deeper: in the self-referential recursion that makes both integration and broadcasting possible. From the PCT perspective (Grude, 2025), a system may exhibit high integrated information (Φ) yet remain non-reflexive if its recursive tracking is too shallow and unstable. Such a system would display global coherence without an intrinsic point of view—corresponding to *happening-as-something* but not *for-itself*. Conversely, when recursive tracking becomes deep, integrative and temporally stable, the process acquires stable self-reference and therefore subjectivity. PCT thus predicts that global broadcasting and reportable access emerge *after* the onset of subjective coherence, not before.

7   Methodological Note: Philosophy and Scientific Formalization

Philosophical analysis and scientific formalization play complementary roles in the development of Process Consciousness. Philosophical inquiry clarifies concepts, identifies hidden assumptions and frames the fundamental questions about subjectivity. Scientific formalization, by contrast, transforms these clarified concepts into measurable constructs and mathematical models. The process-ontological foundation developed here guides the construction of future empirical investigations. These investigations do not replace philosophical reasoning; rather, they operationalize it. The relationship is reciprocal: philosophy provides direction and coherence, while formalization tests and refines the philosophical insights against empirical reality. Understanding this methodological interplay is essential for appreciating how Process Consciousness moves from conceptual roots to scientific rigor.

The remainder of this paper therefore remains at the level of conceptual analysis. It does not rely on any particular formal metric, but it clarifies why such metrics might later be useful. A companion paper

develops a quantitative framework that draws on the ideas introduced here; the present work should be read as its philosophical prelude.

8 Addressing Core Objections

Property dualism. A property dualist may object that "*happening*" could be purely physical without any phenomenal quality. On this view, the world consists of physical substances that bear both physical and mental properties, and the phenomenal seems irreducible. Property dualism holds that there is one kind of substance, the physical, but two distinct kinds of property: physical and mental (Robinson, 2023). Mental properties are thought to be non-physical properties that supervene on physical substrates such as brains (Robinson, 2023). Our epistemic anchor, however, is not the claim that any physical event is *experience*; it is the recognition that when there is *experience*, what is given beyond doubt is that *something is happening*. We do not assume that every physical process is experiential; we highlight that wherever *experience* occurs, it is a *processual happening*. The framework dissolves the so-called explanatory gap by redefining the terms: the "mental property" is not a property attached to a substance but the process of recursive self-tracking itself. The "what it is like" is not an extra property attached to the process; it is the intrinsic perspective of the process when it models its own dynamics. We are not explaining how the physical produces the mental; we are arguing that what we call "the mental" is a specific mode of physical (processual) organization. The apparent irreducibility of the mental arises from mistaking the descriptive vocabulary for an extra ontological category. By focusing on the processual dynamics, their recursive organization and their thermodynamic imperatives, we can explain why some happenings are accompanied by subjective feel without invoking a separate mental substance or property.

Beyond stipulation. One might object that identifying recursive selftracking with subjectivity is merely a stipulation, leaving the property dualist unmoved. However, this is not an arbitrary identification but a redescription of what phenomenological reflection reveals: the only difference between a process that is merely happening and one that is conscious is that the latter includes its own happening in its field. When a process models its own change, there is nothing further to be added to make that modeling *feel like something*; the feel is the modeling itself. In other words, the transition from "physical process" to "experience" does not require a mysterious ingredient, only a structural transformation—from open dynamics to a loop that folds back on itself. This structural equivalence dissolves the purported gap between physical and mental without appealing to ineffable properties.

Recursive topology of qualia. The qualitative richness that motivates property dualism can be naturalized within this process framework. Each distinct qualitative tone—"redness," "bitterness," "pain"—corresponds to a particular stability class within the system's recursive topology. In structural terms, such classes are defined by unique patterns of integration and stability across subsystems—topologically distinct attractors within the same dynamic manifold. The phenomenal difference between redness and pain is thus the difference between two recursively stable curvature patterns of the happening itself. Qualia diversity becomes a matter of *which topology of recursion is stabilized*, not of adding a non-physical property. The irreducibility perceived by the dualist is therefore not ontological but topological—arising from the system's internal geometry of self-reference.

The variety of qualia. Another objection holds that dissolving the *homunculus* does not explain why the qualitative characters of *experience* differ—why the "redness" of red is not the "sharpness" of a C-sharp chord. Philosophers refer to these introspectively accessible, phenomenal aspects of mental life as *qualia*. *Qualia* are defined as instances of subjective, conscious experience—the "what it is like" character of mental states (Tye, 2025). Examples include the perceived sensation of pain, the taste of wine and the redness of an evening sky (Tye, 2025). In the present framework, qualitative differences correspond to differences in the pattern of the *happening*. A red *experience* and a C-sharp *experience* are not two different substances but distinct relational configurations within the same *recursive process*. Different qualia are like different algorithms or data structures executed within the same recursive computational substrate. The "redness" of red is the specific way the visual system recursively processes wavelength information, integrating it with memory, affect and cross-modal data, creating a unique, stable dynamical pattern. The *feel* is the processing itself—the particular stabilization of the recursive pattern for "red". Just as a recursive function yields different outputs depending on its input and internal state, a recursive experiential process yields different feels depending on how it differentiates and integrates sensory inputs. Fully articulating how specific patterns map to specific *qualia* requires an empirical theory of neural

dynamics, but the conceptual framework dissolves the need for a separate ontological category to house *qualia*.

Definitions of 'happening'. A further objection suggests that defining '*happening*' as *experience* begs the question. However, the argument does not conjure a mysterious quality into existence; rather, it starts from the phenomenological given that there is something occurring. It is not an inference but a pre-conceptual recognition. The term *experience* is used as a convenient shorthand for the structural invariants that arise when a process recursively models its own dynamics; it does not presuppose any pre-existing subject or felt quality. The *Buddhist analyses* of *not-self* remind us that even this recognition does not imply an enduring subject (Siderits, 2021). What differentiates an experiential *happening* from a non-experiential physical event is not assumed but discovered through *recursive self-tracking*: when a process models its own *happening*, the *happening* becomes *for itself*. If a process cannot model itself, there is no *for itself* and thus no *experience*.

9 Toward Quantification and Empirical Testability

Although this paper limits itself to the philosophical foundation, its implications extend directly to the quantitative framework of *Process Consciousness Theory* (PCT). In PCT, concepts such as recursion depth, integration density, temporal stability and energetic efficiency formalize the dynamics of self–tracking and experiential coherence. These quantities operationalize what the present analysis identifies conceptually: the transition from mere happening to awareness of happening. The linguistic residue of substance ontology is thereby replaced with empirically tractable parameters that converge on objective structure. In this way, the epistemic root "something is happening" and its thermodynamically grounded recursive unfolding provide a rigorous foundation for both philosophical understanding and scientific measurement. Whereas Integrated Information Theory (IIT) quantifies consciousness by measuring integrated information(Tononi, 2008), PCT emphasizes processual recursion and thermodynamic imperatives.

Empirically, the transition from mere happening to self–tracking corresponds to measurable thresholds in recursive coherence—e.g., neural phase–locking persistence exceeding approximately 300–400 ms(Gaillard et al., 2009, Auksztulewicz and Friston, 2016), or an analogous threshold in temporal stability within the PCT formalism.

Future work in Process Consciousness Theory (v3.x) will extend this foundation by formalizing the quantitative dynamics of recursion, integration, temporal stability, and energetic efficiency through expanded definitions of these constructs, providing an explicit empirical architecture for testing the framework.

This framework dissolves not only the homunculus but also the intuition of "conscious substance"— revealing it as the phenomenological signature of recursive folding (Grude, 2025).

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