Taming the Brute Fact: A Falsifiable Resolution to the Hard Problem and the Explanatory Gap

Abstract

The hard problem of consciousness asks why physical processing is accompanied by subjective experience. This paper argues that the inherited formulation contains an additional unexplained term: the experiencer to whom phenomenology is said to belong. Converging biological and temporal constraints place the relevant apparent experiencer downstream, deriving it as a recursively generated narrator-level reference point rather than a primitive subject. Recognition, autobiographical reconstruction, attribution, ownership, report, and the organization of experience as "mine" depend upon later operations involving memory, comparison, prediction, recursive cognition, and psychological time. The apparent subject nevertheless appears retrospectively as though it had been present from the beginning. The resulting category error occurs when this downstream product is projected backward and assigned the primitive category of experiencer.

Once the apparent experiencer is derived rather than assumed, the remaining explanatory target is primary phenomenology: the organism-relative inside view of the event prior to explicit recognition, ownership, conceptual interpretation, or report. Primary phenomenology is proposed as the phenomenal aspect of a complete bounded organism-relative biological event, rather than as a second product generated by physical processing and delivered to an inner observer. The same organism-relative architecture extends from regulation and valuation through cognition and recursive self-reference while preserving the distinction between primary phenomenology and the later processes through which an event becomes recognized, attributed, owned, remembered, and reported.

The proposal is constrained by more than conceptual coherence. Any adequate account must explain phenomenology without an additional observer, derive rather than presuppose the subject, preserve dissociations among phenomenology, ownership, access, memory, behaviour, and report, remain compatible with perturbational and comparative biological evidence, account for the generation and continuation of thought, specify measurable biological consequences, and permit empirical failure. The central architectural claim of the manuscript is that one organism-relative organization satisfies these constraints simultaneously rather than requiring separate explanatory mechanisms for each.

The Mapping Theorem renders the remaining phenomenology–biology relation empirically vulnerable by separating three terms: the complete bounded biological event, primary phenomenology, and the Friction Signature measurement representation used to obtain partial exterior access to relevant biological dimensions. Friction Signatures are therefore not identified with phenomenology itself. The Stochastic Pump is treated as a proposed systems-level support architecture rather than a mechanism that manufactures consciousness. Quantitative operationalizations specify multidimensional biological trajectories across recursive, autonomic/regulatory, metabolic/energetic, network, complexity, and temporal domains, with complementary perturbational constraints developed through reversible suppression under anesthesia and sustained recursive persistence under rumination. Prespecified state definitions, competing models, holdout validation, construct-invariance requirements, and explicit failure conditions prevent successful classification from being treated as identity proof. These models are first-generation operationalizations requiring prospective validation, not established universal identity laws. Together, the architecture derives rather than presupposes the apparent experiencer while leaving the proposed relation between primary phenomenology and the complete bounded biological event open to direct scientific constraint.

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Introduction: Taming the Brute Fact

The explanatory gap in consciousness research arises at an unusual boundary. Biological science can describe increasingly detailed relations among sensory registration, neural activity, integration, memory, attention, behaviour, report, autonomic regulation, and the changing organization of living systems. Yet even a sufficiently detailed exterior description appears to leave something further to explain: that there is subjective experience—that there is something it is like for the organism at all. Physical structure and function can be specified while the existence and character of phenomenology appear to remain an additional fact about the system. This apparent remainder is the central problem addressed by the present manuscript.

Chalmers's formulation of the hard problem isolates this apparent remainder with unusual clarity. Even if the functional problems of discrimination, integration, access, behaviour, and report were fully explained, a further question would appear to remain: why should any of that physical processing be accompanied by experience at all? Why should there be something it is like for the organism? On this formulation, phenomenology appears both additional to and irreducible within the functional description. It is this apparent explanatory remainder that the title Taming the Brute Fact names. The Brute Fact Framework accepts phenomenology itself as the genuine explanatory target; it does not attempt to dissolve the hard problem by substituting access, cognition, report, or behavioural function for experience.

Yet the hard-problem formulation also contains another term. To ask why there is something it is like for an organism, or to speak of a subject of experience, is not to refer to phenomenology alone. It places phenomenology in relation to an experiencer. The framework therefore asks whether that experiencer is entitled to primitive status. The biological and temporal convergence developed across the architecture excludes that primitive placement. The relevant apparent experiencer is instead derived as a recursively generated, temporally downstream narrator-level reference point. What ordinarily becomes "my experience" depends upon later operations of recognition, reconstruction, attribution, ownership, retained information, and thought operating through psychological time. The resulting reference point nevertheless appears as though it had been present from the beginning. The conflation occurs when this downstream product is projected backward and assigned the primitive category of experiencer.

That empirical constraint changes the order of inquiry and is foundational within this framework. The manuscript does not begin by asking how phenomenology is presented to a pre-existing subject; it first asks what remains of that formulation once the apparent experiencer is itself placed within the biological and causal-temporal architecture. The framework does not deny phenomenology, biological agency, cognition, memory, behaviour, self-reference, ownership representations, or report. Nor does it explain consciousness by adding a second substance, independent internal observer, fundamental witness, or separately manufactured phenomenal product. Instead, biological, temporal, and empirical constraints are used to separate explanatory levels ordinarily compressed into the expression subjective experience and to ask what operations are actually required at each level.

Once the apparent experiencer is temporally constrained to a downstream position, the primary explanatory target is phenomenology itself: the organism-relative inside view of an event prior to its explicit recognition, autobiographical ownership, conceptual interpretation, or report. The term organism-relative is important. Phenomenology is not proposed as a perspective from nowhere, nor as a field viewed by an additional internal entity. A bounded living organism already provides a physically and biologically situated organization within which environmental and internal conditions can be differentially registered, integrated, retained, valued, and acted upon. The remaining explanatory question is whether the organism-relative inside view and the complete bounded biological event can be understood as two characterizations or aspects of the same organized occurrence.

The apparent subject or experiencer is not removed by stipulation; it is derived. Its biological derivation is developed progressively through organism-relative indexing, memory, comparison, prediction, attribution, recursive cognition, language, and psychological time. These processes can organize changing biological and representational states around a recurring virtual reference point. Through repeated first-person indexing, that reference point appears as the thinker of thought, owner of experience, observer of perception, evaluator of psychological conditions, and controller of action. The self-referential processes themselves are materially implemented, biologically real, and causally consequential. What is virtual is the additional independently existing owner represented as standing behind or prior to those processes. Later sections develop the recursive and temporal architecture of this derivation in greater detail.

The distinction between these levels is not merely semantic. Physical processing requires time. Recognition, reconstruction, attribution, ownership, and report therefore cannot be temporally identical to every antecedent process upon which they depend. The manuscript develops this constraint through System Latency and through converging evidence concerning perception, ownership, agency, memory, report, dissociation, altered states, and biological perturbation. These constraints place narrator-level recognition and ownership downstream of the processes upon which they depend and exclude the resulting reference point from the antecedent position required of a primitive experiencer.

Once that temporal and architectural placement is established, the explanatory problem changes. The apparent experiencer cannot be both a recursively generated downstream product of the biological process and the primitive subject presumed to precede that process as the recipient or owner of phenomenology. The framework instead derives the apparent subject within the biological and recursive architecture and then returns to the remaining explanatory question: once the presumed recipient has itself been

explained, what is left to explain, and what is the relation between the complete bounded biological event and primary phenomenology itself?

That correction has consequences beyond the conventional hard problem. If the apparent experiencer is generated within the processes to which experience is subsequently attributed, the same reversal of explanatory order can be examined elsewhere. A recursively generated evaluator can appear to stand independently before the evaluation it performs. Valuation can appear as the activity of an evaluator standing apart from what is evaluated. Regulation can appear as the activity of a controller standing apart from what is controlled. Organism-relative psychological significance can appear to belong intrinsically to an event while the relation through which that significance was generated recedes from view. When such divisions are recursively sustained through thought operating in psychological time, the architecture becomes relevant to psychological conflict and suffering. The later sections therefore examine the evaluator–evaluated relation, recursive continuation of thought, psychological division, and Insight without introducing a second inner witness or controller to explain their operation.

These extensions are not independent theories appended to an account of consciousness. A central methodological requirement of the manuscript is that one coherent architecture must satisfy multiple independent constraints.

The same distinctions must remain stable across primary phenomenology and report, temporal ordering, self-generation, animal cognition, ownership and agency, altered states, recursive thought, psychological division, comparative biology, anesthesia, rumination, and the empirical Mapping programme. Definitions cannot change opportunistically from one domain to another. A narrator constrained to a downstream position in the temporal argument cannot become primitive in the phenomenological argument. A Friction Signature defined as an exterior measurement representation cannot later become phenomenology itself. A biological support architecture cannot become an unexplained generator when convenient. A behavioural endpoint cannot silently become a direct measure of phenomenal presence or absence. An identity proposition intended to be scientific must remain vulnerable to failed prediction, failed construct validity, failed generalization, and simpler competing models.

The evidential significance of this architecture therefore lies in convergence rather than in any single observation. Temporal evidence alone does not establish the complete framework. Neither do dissociations of selfhood, comparative cognition, altered states, metabolic measurements, network organization, or any individual biomarker. Their significance lies in whether independently motivated constraints can be satisfied by the same causal organization without requiring incompatible explanatory assumptions. Apparently separate problems therefore function as tests imposed upon one proposed architecture rather than as occasions for introducing separate mechanisms whenever difficulty arises.

Once the apparent experiencer and the functions attributed to it are derived within the biological and recursive architecture, no additional subject-side term is required in the phenomenology–biology relation. What remains is the organism-relative inside view itself and its proposed relation to the complete bounded biological event. Explaining the apparent experiencer therefore does not by itself establish the biological identity proposition; it removes a conflated term from the problem and leaves the remaining phenomenology–biology relation exposed to empirical test.

The phenomenology–biology identity proposition bears a separate and stronger empirical burden. The framework proposes that primary phenomenology is not a second product manufactured by biological activity and subsequently delivered to an observer. It is proposed as the organism-relative phenomenal aspect of the complete bounded biological event itself. That proposition cannot be secured merely by declaring an identity. It must be constrained by an independently specified biological architecture, measurable consequences, perturbational evidence, state-specific predictions, competing models, validation requirements, boundary cases, and explicit failure conditions.

The later Mapping programme is developed for this purpose. The Stochastic Pump is introduced as a proposed systems-level support architecture organizing distributed biological work required to maintain, recruit, and restore the conditions under which bounded organism-relative events occur. It is not proposed as a new phenomenal substance or as a mechanism that manufactures consciousness. Friction Signatures provide an empirical interface to selected exterior dimensions of the changing biological organization. They are measurement representations, not the complete biological event and not phenomenology itself. Sections 17 and 18 then formalize the Mapping Theorem and its quantitative operationalization as a falsifiable programme for testing the proposed relation between the complete bounded biological event and primary phenomenology.

The distinction is deliberate. The manuscript makes a strong architectural claim where the derivation permits one and preserves an empirical boundary where prospective testing remains necessary. Deriving the apparent experiencer within the architecture does not itself prove every biological identity condition. Conversely, the fact that the biological identity programme remains experimentally vulnerable does not restore an explanatory role for an independent subject whose relevant functions have already been derived within the biological and recursive organization.

Structure of the Argument and Reading Pathways

The manuscript is cumulative. Its strongest form is therefore obtained by reading it sequentially, because later conclusions inherit distinctions established earlier. Nevertheless, its breadth means that readers from different disciplines may reasonably wish to emphasize different portions of the argument. The pathways below identify points of emphasis rather than independent versions of the framework.

The opening sections establish the organism-relative biological architecture, the distinction between primary phenomenology and later recursive organization, the bounded event, comparative biological constraints, and the physical support architecture in which

the Stochastic Pump is developed. The comparative and phylogenetic material is important because it prevents human narration from being projected backward as a prerequisite for more primary forms of organism-relative organization. It also leaves the phenomenal boundary open rather than inferring phenomenology merely from biological responsiveness, memory-like state retention, or adaptive behaviour.

Sections 8 through 10 form a central conceptual spine. Section 8 develops System Latency and the downstream position of narrator-level recognition and ownership. The intervening architecture develops measurable exterior consequences associated with bounded biological events. Section 10 then gives the full recursive and temporal development of the virtual narrator and apparent subject, including their maintenance, causal efficacy, temporal position, and relation to ownership, agency, and first-person attribution.

Subsequent sections stress-test and extend these distinctions before Section 14 returns directly to the explanatory formulation itself. There the manuscript develops the Category Error argument, separates primary phenomenology from access, recognition, memory, ownership, introspection, and report, and asks whether an unexplained recipient retains any necessary role once the subject-side derivation has been completed. Section 15 then follows the same architecture into psychological time, evaluator–evaluated division, recursive suffering, the generation and continuation of thought, and Insight.

Sections 17 and 18 constitute the principal empirical Mapping programme. They specify the proposed identity relation, separate the complete biological event from its measurement representations, define anchor-specific and cross-anchor validation requirements, develop quantitative operationalizations, require competition with simpler models, preserve failure rather than permitting post hoc rescue, and establish the conditions under which the biological identity programme can gain or lose empirical support.

Readers approaching the manuscript primarily from philosophy of mind may therefore wish to emphasize the foundational distinctions, System Latency, the recursive and temporal development of the virtual narrator in Section 10, the Category Error and derivation of the apparent subject in Section 14, the consequences for psychological division in Section 15, and the conceptual statement of the Mapping Theorem in Section 17.

Readers approaching primarily from neuroscience or consciousness science should retain enough of the common conceptual spine to understand why narrator-level ownership, report, and behavioural responsiveness are not being used as definitions of primary phenomenology. They may then place greater emphasis on the bounded biological event, Stochastic Pump, Friction Signatures, perturbational and dissociation evidence, System Latency, and especially the methodological and quantitative architecture developed in Sections 17 and 18.

Readers approaching from cognitive science or psychology may wish to emphasize the transition from organism-relative cognition to recursive self-reference, the generation of the virtual narrator, psychological time, thought recruitment and continuation, evaluator–evaluated division, recursive psychological organization, and Insight, before returning to the Mapping programme that constrains these processes biologically.

These pathways are routes of emphasis rather than substitutes for the cumulative argument. The philosophical, cognitive, and biological components are deliberately interdependent. A principal test of the proposed architecture is whether the same architecture survives examination from each direction.

The manuscript therefore proceeds from a simple but consequential change in explanatory order. It does not grant an experiencer primitive status and then ask why biological processing is accompanied by experience for that subject. It asks what occurs in the bounded organism, what must be temporally and causally prior, how the apparent experiencer is generated within that process, what explanatory remainder remains once that derivation is complete, and whether the remaining biological–phenomenological relation can be rendered empirically vulnerable.

To tame the brute fact is not to explain phenomenology away. It is first to determine whether part of what appeared brute and irreducible was produced by a malformed explanatory question—one that projected a downstream, recursively generated experiencer backward into the primitive position from which the problem was posed. Once that artificial subject-side remainder is removed, what genuinely remains must be subjected to the strongest biological and empirical constraints available.

1.0 The Construction of the Narrative Self

1.1 Organism-Relative Awareness Before the Narrative Self

The ordinary experience of selfhood presents perception, thought, and action as activities belonging to a persistent inner subject. The present framework reverses that presumed order. It proposes that organism-relative registration, valuation, integration, and regulation precede the mature narrative self. The conditioned narrator develops later through the recursive organization of retained biological history, social attribution, language, and anticipated future states.

Early biological processing does not require the representation of an explicit autobiographical owner. Sensory and interoceptive events can be registered, affectively valued, integrated with bodily state, and translated into orienting, withdrawal, autonomic adjustment, or retained learning before the organism can represent those events as belonging to an enduring "me."

These processes do not occur from nowhere or from an organism-independent perspective. They are organism-relative by architecture. Changes are registered and evaluated according to their consequences for the condition, regulation, viability, and possible actions of the living system in which they occur. This organization is not created later by language or reflection. It is already present in perception, bodily regulation, valuation, and adaptive response.

An infant who encounters an aversive thermal stimulus, for example, may withdraw, undergo autonomic change, register distress, and retain the effects of the event [3, 4]. None of these processes requires an internal narrator first to formulate, "I am in danger." The organism registers what has occurred, responds according to its biological significance, and is altered by the event.

> *Put plainly, the organism can feel, evaluate, learn, and respond before it can organize those events into the story of a persistent "me."*

This foundational organization should not be conflated with the later narrative self. The organism can distinguish internal from external conditions, harmful from beneficial change, and viable from threatening states without representing those distinctions through a mature autobiographical identity [1, 2]. What remains undeveloped is the recursively maintained reference through which events are later remembered, interpreted, and organized as belonging to one temporally continuous subject.

The early biological response is therefore not impersonal in the sense of having no relation to the organism. It is intrinsically centred on that organism's bodily condition and adaptive requirements. What is not yet required is the additional attribution through which the event becomes represented as something that happened to "me."

Retained biological history provides the basis for this later development. Prior events leave altered dispositions, learned associations, and accessible representations that can influence subsequent perception, valuation, and action [5, 6]. While inactive, these traces remain part of the organism's biological history. When reactivated and related to present conditions, they become available for comparison, interpretation, and anticipation.

A painful event, for example, may later influence how a similar situation is evaluated. The present response is then shaped not only by the immediate stimulus but also by retained biological history. As this history becomes increasingly available through memory, social attribution, and future projection, events that originally occurred separately can begin to be linked across time.

In ordinary language, the past begins to participate in the present. What happened before can now influence what the organism expects, avoids, seeks, or prepares to do next.

The developmental sequence proposed here therefore begins with organism-relative registration and valuation. It proceeds through the retention and reactivation of biological history and becomes increasingly elaborated through memory, social learning, language, comparison, and anticipation [5–7]. The conditioned narrative self emerges from this progressively recursive temporal organization.

The narrative self is not installed into otherwise neutral biological machinery. It develops as an elaboration of an already active organism-relative architecture. As remembered events, present conditions, and anticipated outcomes are repeatedly organized around the same living organism, they become increasingly represented through the relations "I," "me," and "mine."

This recursively maintained self-reference will later be described as a virtual reference point. The term does not imply that the underlying biological and representational processes are unreal. It distinguishes those real processes from the additional appearance of an independently existing inner owner standing apart from them.

The central claim is therefore not that early life contains no self-related organization. Basic bodily regulation, affective valuation, self-location, and organism-centred action are already present in developing form [1, 2]. The claim is that these processes do not require a fully developed, linguistically articulated, autobiographically continuous owner standing behind them.

The biological process comes first. The narrative owner is constructed later from the organism's retained and recursively organized history.

The following sections examine how social attribution and language stabilize this developing reference, how thought operating through psychological time gives it apparent continuity, and why the resulting narrator is eventually mistaken for the author and owner of the very processes from which it arose.

1.2 From Organism-Relative Reference to Narrative Identity

The organism-relative architecture described in the preceding section is present before the development of a mature narrative self. Biological states are already registered in relation to the organism's condition, needs, and possible actions. Development does not create this basic reference from nothing. It progressively elaborates it through memory, social interaction, language, and repeated attribution.

From early in life, caregivers and the surrounding social environment repeatedly identify the developing organism as the same individual across changing situations [6, 7]. A name becomes a stable social reference through which bodily states, actions, possessions, intentions, successes, failures, and relationships are attributed to one person.

The child is not merely exposed to events. Those events are increasingly described as happening to, being performed by, or belonging to the same socially identified individual. The same name is used when the child is comforted, corrected, praised, photographed, reminded of an earlier event, or told that an object belongs to them.

Consider a child reaching for a toy. A caregiver may say, "That is your toy," "You picked it up," or "You wanted it." The event is not only registered biologically. It is also described through a stable social reference that links the action, the object, and the intention to the same developing individual.

> *Put simply, the organism-relative reference begins to acquire a name, a social history, and a repeated place within language.*

This repeated attribution contributes to the formation of a conditioned self-representation. That representation is not a single image or fixed mental object. It is a dynamic organization of bodily information, affective responses, remembered events, social evaluations, learned roles, possessions, relationships, and anticipated consequences.

As these elements are repeatedly related to the same organism, they begin to form an increasingly coherent personal history. Events that originally occurred as separate biological episodes can later be connected as events that happened to the same person [5–7].

Language plays a major role in stabilizing and extending this organization [6, 7]. Pronouns and possessive terms provide explicit categories through which biological and social events can be represented as "I," "me," and "mine." A sensation becomes "my pain," an intention becomes "what I want," an action becomes "what I did," and a remembered event becomes "what happened to me."

These expressions do not create organism-relative significance. That significance is already present in the organism's biological registration and valuation of events. Language makes the reference explicit and repeatedly connects changing states to the same socially recognized individual.

Language therefore does not create the organism-relative reference. It gives that reference an increasingly stable name, history, and narrative form [6, 7]. The name and pronouns function as recurring indices through which otherwise changing events can be related to the same developing person.

Ordinary first-person language is not inherently false. The statement "I am hungry" efficiently identifies the organism undergoing a physiological state. The error arises only when the linguistic index "I" is interpreted as an additional inner subject standing apart from the bodily process and possessing it.

At this stage, language provides part of the structure through which such later reification becomes possible. The pronoun refers usefully to the organism, but repeated use can also support the appearance of a stable inner owner to whom bodily states, thoughts, and actions belong.

Grammatical structure may further reinforce this appearance. Subject–verb constructions routinely place a subject before an action: "I thought," "I chose," "I acted." This order is useful for communication, but it does not necessarily reproduce the biological sequence through which thought, intention, recognition, and attribution arise.

The grammatical subject may therefore appear to initiate a process that the biological system has already begun to generate. Later sections will examine this inversion directly. At this point, the narrower claim is that language can make a recurring reference appear causally prior to the processes attributed to it.

Mirror self-recognition provides one visible developmental marker within this broader progression [2, 8]. When a child begins to relate a reflected image to its own body, visual information is being integrated with an existing bodily self-representation and social recognition.

This ability should not be treated as the moment at which selfhood begins or as evidence of a fully formed narrative identity [2]. It is one indication that an external representation can be incorporated into an existing and developing organism-relative model.

A child may see a mark on the reflected face and reach toward the corresponding location on its own body [8]. The reflected image has been connected to the organism's bodily reference. Yet this does not by itself establish an autobiographical narrator. It shows one component of a larger developmental process.

For narrative identity, a more consequential transition occurs as remembered events become linked across time. A prior injury, social response, reward, failure, or attachment is no longer retained only as an altered biological disposition. It can be reactivated, represented, and connected with other events as part of a personal history [5–7].

For example, a child who was previously laughed at after making a mistake may later approach a similar situation with hesitation. The earlier event influences present evaluation. When the event can also be remembered and represented as "what happened to me," it becomes part of a continuing autobiographical structure.

The past is no longer merely retained in the organism. It is increasingly organized as the history of "me."

Anticipation extends this same reference into the future [9, 10]. Social expectations, possible threats, desired outcomes, and imagined consequences are represented as conditions that may affect the same individual. The developing system begins to organize not only what happened to "me," but also what may happen to "me" next.

The narrative self therefore acquires temporal depth through the repeated integration of remembered past, present evaluation, and anticipated future.

Continuity need not be computed as a separate objective. It can emerge because changing experiences are repeatedly indexed to the same organism through bodily regulation, memory, social attribution, and language. The contents of the self-representation may change substantially, while the recurring form of reference remains: this happened to me, this concerns me, and this may affect me later.

> *In plain terms, the "me" appears continuous because different events are repeatedly organized as belonging to the same person.*

The resulting narrative identity is biologically and socially useful. A stable self-reference supports communication, learning, planning, responsibility, social coordination, threat assessment, and the organization of long-term goals. Information concerning the organism's history, condition, obligations, and possible future can be coordinated through one recurring reference.

The adaptive value belongs to this coordination. It does not require the existence of an independently enduring owner standing behind the process. A stable reference can organize information effectively without constituting an additional entity within the organism.

The biological implementation of this process is real. Memory retrieval, linguistic representation, social evaluation, anticipation, and self-attribution depend upon physically instantiated neural and regulatory activity. What emerges through their repeated integration is the appearance of a unitary subject to whom these changing processes belong.

The narrative self is therefore not created by language alone, nor is it imposed upon otherwise impersonal biology. It develops when an existing organism-relative architecture is progressively elaborated into a socially identified, linguistically explicit, and autobiographically extended reference [1, 2, 5–7].

The biological reference was already present. Development gives it a name, connects it to a history, extends it toward an anticipated future, and repeatedly organizes experience as belonging to "me."

Once retained past and anticipated future are continually organized around this reference, thought begins to generate the temporal continuity through which the narrator appears to persist independently of the biological process that continually maintains it.

1.3 Psychological Time and the Generation of the Apparent Thinker

As retained biological history, present evaluation, and anticipated consequence become recursively integrated, the developing narrative reference acquires temporal continuity. Within this framework, psychological time is not chronological time itself. It is the present movement through which retained past is reactivated in current processing and extended toward an imagined future.

A remembered event does not remain confined to the conditions in which it originally occurred. When reactivated, it becomes part of the organism's present biological state and can alter perception, valuation, attention, and action. Retained history can also be recombined into predictions, plans, abstractions, imagined outcomes, and novel solutions [9, 10].

Novel thought is not independent of the past merely because its result has not occurred before. The materials, categories, learned relations, constraints, and operations through which novelty is generated arise from the biological history retained by the organism. Thought may produce a new combination, but it does so through structures formed by what the organism has already encountered and learned.

Psychological time therefore consists of more than passive storage. It is the active organization of remembered past, present conditions, and anticipated future within current organism-relative processing. Past and future operate biologically only through present reconstruction or projection.

Consider a person who once experienced public embarrassment. A later social situation may reactivate that history. The present interaction is then evaluated not only through what is happening now, but also through what happened before and what the person anticipates may happen next. A remembered event becomes a present expectation and then an imagined future.

> *Put simply, the past is carried into the present and projected forward.*

These changing temporal contents are repeatedly organized around the same organism-relative reference. A prior event becomes what happened to "me," a present state becomes what is happening to "me," and an anticipated outcome becomes what may happen to "me." The particular memories, evaluations, and projections continually change, but the recurring form of attribution remains.

This repetition generates the appearance of continuity. Each new thought is related to the same remembered organism and can become represented as "my thought." Because this attribution is renewed across successive states, the recurring "me" appears to remain constant while thoughts, emotions, perceptions, and circumstances change.

The apparent continuity of the thinker does not therefore require an unchanging entity to persist from one moment to the next. It can arise because changing biological content is repeatedly organized around the same reference.

> *In plain terms, the "me" appears continuous because different memories, feelings, and expectations are continually treated as belonging to the same person. Conceptually remove remembered past and anticipated future from the autobiographical construction, and its temporally extended narrative continuity is removed with them.*

A further division then appears. Instead of being represented as a reference continually generated and updated within thought, the recurring "me" is represented as the thinker standing prior to thought and producing it. Thought is thereby organized as though it consisted of two independent components: a stream of thought and a separate subject who owns, observes, and directs that stream.

The organism does not consciously reason its way to this conclusion. The apparent thinker is embodied in the organization of the process itself. Repeated self-attribution presents thought through such relations as "I think," "I remember," "I fear," and "I intend." Because these attributions recur continuously, the reference expressed as "I" appears to precede the activities attributed to it.

The underlying relation is more precise. The organism's thought-process recursively organizes its activity around a recurring self-reference—a virtual reference point. That reference is then experienced as separate from the thought-process that continually reconstructs it.

The division is therefore real as an experienced organization, but it does not establish the existence of two independently instantiated entities. There is thought, including thought organized as "I," but no additional thinker standing apart from that movement.

The construction is difficult to recognize because conscious access ordinarily presents the completed attribution rather than the full sequence through which it arose. A thought becomes available already as "my thought," while the processes that generated both the thought and its attribution are not presented together. The apparent owner can therefore seem prior to its own construction.

Memory supplies continuity. Bodily sensation supplies immediacy. Language supplies a stable grammatical subject. Social interaction repeatedly addresses the organism as one enduring individual. Together, these processes make the recurring reference feel as though it had been continuously present throughout the activity that reconstructs it.

For example, a critical remark may activate a remembered history of rejection. The resulting thought may appear as "I am being judged again." By the time the event is recursively available, the evaluation, memory, bodily response, and attribution to "me" have already been integrated. The apparent thinker is therefore experienced as the one who recognized and interpreted the event, even though that reference was itself renewed through the same process.

The result is not an explicit deception. It is an architecture whose completed output obscures its own derivation.

Organism-relative reference itself is functionally necessary. A living system must coordinate bodily condition, environmental change, retained history, and possible action in relation to its own continued organization. This reference allows the organism to distinguish what affects it, what belongs to its history, and what consequences may follow from its actions.

Within the present framework, reification of this reference as an independently existing thinker can arise as a structural consequence of how memory, valuation, temporal recursion, and repeated self-attribution become organized within the organism.

The adaptive function belongs to organism-relative coordination. The apparent independent thinker emerges when the continuity of the repeatedly regenerated reference is mistaken for the continuity of an entity. What persists is the recursive organization of changing biological content, not an invariant subject standing outside that organization.

> *In plain language, the organism needs a stable way to organize information about itself. It does not need a separate inner controller. The apparent controller emerges when the useful recurring reference is mistaken for an independently existing thinker.*

Language strengthens this development but does not originate it. Self-referential organization does not require language as its biological foundation. Names, pronouns, possessive terms, and autobiographical narration make the reference explicit, reinforce its apparent continuity, and embed it within social conditioning.

Language therefore elaborates an organization already developing through retained biological history, bodily regulation, valuation, and temporal recursion. It gives the reference a stable verbal form through which the organism can represent "I remember," "I want," "I fear," and "I will."

Bodily and affective states give the self-reference further immediacy. Fear, anger, pain, desire, and anxiety are real organism-relative biological events whose phenomenal character arises from physically instantiated processes. Their later representation as "my fear," "my anger," or "my pain" organizes those events around the conditioned narrator and can make the apparent owner feel physically substantial and located within the body.

The biological event and its recursive evaluation must nevertheless be distinguished. Primary organism-relative valuation can arise directly through sensory, interoceptive, affective, and regulatory processes. Recursive evaluation then relates the event to retained history, identity, comparison, anticipated consequence, and the continuity of "me."

A remark, for example, has no intrinsic property of humiliating an identity. When it is evaluated through retained social history as rejection or as a threat to "me," that evaluation becomes a materially instantiated biological state. It can alter autonomic regulation, attention, memory retrieval, perception, and subsequent behaviour [11, 14, 15].

The represented threat may be constructed, but the recursive evaluation and its organism-level consequences are physically real.

> *Put simply, an imagined or identity-based threat can produce a real biological response [11–13]. The content may concern a virtual owner, but the organism still bears the physiological consequences of the evaluation.*

This relation prepares the Self Security Loop developed later in Section 1. An event or internally generated thought can be evaluated in relation to the conditioned self-representation and thereby alter the organism's present state.

That altered state then becomes new material for memory retrieval, anticipation, and further self-referential evaluation. A thought changes the body; the changed bodily state influences the next thought; and the resulting thought is again organized around "me." [12, 13]

Psychological time supplies the temporal architecture of this recursion. Friction can increase when recursive evaluation becomes organized around resistance, contradiction, anticipated threat, unresolved comparison, or protection of the conditioned self-representation.

The loop can therefore continue without an immediate external danger. A remembered insult, imagined failure, anticipated loss, or projected social judgment can function as an internally generated stimulus. The external event may be absent, while the organism continues to produce real cognitive, autonomic, and metabolic consequences [12, 13].

In ordinary terms, the organism can continue reacting to what happened yesterday or to what might happen tomorrow as though the threat were occurring now.

The apparent thinker is not a control agent installed to direct this process. It is the reified form of a continuously regenerated organism-relative reference produced as retained biological history is recursively organized across remembered past, present evaluation, and anticipated future.

The separate narrator has no independent continuity apart from the recursive activity that generates and maintains it. This does not mean that reduced narrative activity eliminates phenomenology, organism-relative regulation, or practical cognition. It means that the autobiographically continuous narrator depends upon the process through which it is repeatedly reconstructed.

The movement of this section can therefore be stated plainly: retained history enters present thought, present thought reconstructs the past and projects possible futures, and these changing states are repeatedly organized as happening to "me." Repeated attribution gives the "me" apparent continuity, and the reference generated within thought is then experienced as the thinker standing outside thought.

Once this generated reference is experienced as the thinker of thought, the architecture is prepared for the next inversion: retrospective authorship of biological events whose initiating processes preceded narrator-level recognition and attribution.

1.4 Retrospective Authorship and the Inversion of Causal Order

The preceding section described how recursive thought organizes remembered past, present evaluation, and anticipated future around a continuously renewed organism-relative reference. Once that reference becomes established as "I," a further inversion occurs: the reference generated within thought is experienced as a separate thinker standing prior to thought.

The biological process does not first produce an independent thinker who then uses thought as an instrument. The organism thinks through materially instantiated processes of memory, valuation, comparison, prediction, inhibition, and action. Within that activity, successive thoughts are recursively attributed to the same temporally continuous reference as "my thoughts."

Because this attribution is repeated across changing events, the recurring reference can appear to persist independently of the process that continually generates and renews it.

The apparent separation can be stated more precisely. The organism's thought-process recursively organizes its own activity around a recurring reference. That reference is then experienced as separate from the thought that continually constitutes and updates it.

The division is therefore real as an experienced organization, but it does not establish the existence of two independently instantiated entities.

There is thought, including thought organized around "I," but no additional thinker has been identified standing apart from that movement.

The inversion occurs when the generated reference is represented as the antecedent source of the process through which it arose. A thought becomes available as "my thought," and the recurring "me" is then experienced as the thinker who produced it.

The processes of thought generate the reference that is later represented as their source. Put more simply, thought is authoring the apparent author. The self does not stand outside thought and produce it; thought generates and maintains the self-reference later experienced as its author.

Consider the sudden recollection of an unfinished task. An internal cue, an environmental association, or an unresolved concern activates retained biological history. The task enters present processing and becomes recursively recognized as "I remembered what I needed to do."

Because the antecedent activation and reconstruction are not separately available within the completed attribution, the event can feel as though an already present "I" deliberately produced the memory. The organism genuinely remembered, but no independent thinker had to stand before the process and initiate it.

> *In plain language, the memory arose within the organism and was then attributed to "me." The attribution does not establish that a separate thinker caused the memory to appear.*

The same inversion applies to action. A person hears a knock at the door and rises to answer it. Sensory registration, learned expectation, valuation, motor preparation, and intention all contribute to the response.

When these processes become recursively organized, the event can be accurately summarized at the organism level as "I decided to stand up." The error begins only when the grammatical "I" is treated as an additional inner controller that existed prior to and independently directed the biological operations through which the decision and action arose.

The organism decided and acted. What is not required is a second entity inside the organism that first issued the command.

Ordinary reports compress distributed biological sequences into simple causal forms:

"I thought."

"I decided."

"I acted."

These expressions are useful summaries of organism-level events. Their grammatical structure places a subject before the process attributed to it, but biological organization need not follow that order.

The apparent subject may instead be the recursively generated virtual reference point through which the completed event becomes recognized, attributed, and reported.

Before a thought can be recognized as "my thought," sufficient biological processing must already have occurred for both the thought and its attribution to become available. The exact interval varies with the event and the processes involved, but the required physical processing cannot be instantaneous.

Narrator-level recognition therefore occurs downstream from the biological activity it later represents as belonging to "me."

> *Put simply, the narrator cannot recognize and claim a thought before the organism has generated enough of that thought for recognition and attribution to occur.*

Research on voluntary action is consistent with this separation. Neural preparation, conscious intention, motor execution, awareness of movement, and reported authorship can be experimentally distinguished rather than treated as one indivisible act transparently initiated by an inner controller [17–20].

Their integration can produce the seamless experience that "I decided and then acted," but that experience does not reveal the full biological sequence through which intention, action, and attribution of ownership were formed.

The narrator does not consciously falsify the sequence or intentionally take credit for an event it did not produce. The completed self-representation simply does not provide transparent access to the distributed operations that generated both the event and its attribution.

Because the result becomes available already organized as "my thought" or "my action," attribution can be experienced as authorship.

The concealment is therefore architectural rather than deliberate. The completed product contains the attribution to "me," but not a transparent representation of the full process that generated both the event and that attribution. The apparent owner is encountered in the result and can therefore seem to have preceded the process that produced it.

This inversion arises naturally from the organization established in the preceding sections. Successive thoughts and actions are repeatedly attributed to the same organism-relative reference. Each attribution strengthens the appearance that the recurring reference existed before the process and initiated it.

The organism does not consciously reason its way to that conclusion. Apparent authorship is built into the organization of the process itself.

> *In plain terms, the process produces the reference, but the reference is experienced as though it produced the process.*

This does not deny agency. The organism evaluates alternatives, remembers prior outcomes, inhibits responses, forms intentions, changes course, and acts upon its environment. Thoughts and intentions are physically instantiated and can causally influence what follows.

The argument rejects only the apparent separation of an independent thinker from the organism's thought-process.

The thought, the self-attribution, and the later causal influence of that attribution are all processes of the same organism. A narrator-level representation can influence subsequent processing once generated; that later causal efficacy does not make it the antecedent author of the event it later claims.

The false architecture is that an independent thinker possesses thought and uses it to direct the organism. The proposed architecture is that the organism thinks, evaluates, predicts, inhibits, and acts through materially instantiated processes, while recursive thought simultaneously generates the reference to which those activities are attributed.

There is agency, but it belongs to the organism as an integrated biological process. It does not require a separate inner agent standing outside thought.

Retrospective authorship also reinforces the apparent continuity of the narrator. Each remembered thought, intention, and action becomes further evidence in an autobiographical sequence: "I thought this," "I chose that," and "I caused what followed."

The recurring attribution makes the generated reference appear increasingly stable, independent, and causally primary. The more often changing events are organized as actions of the same "I," the more natural it becomes to experience that "I" as the enduring source of thought and action.

> *The movement of this section can therefore be stated plainly. The organism thinks and acts. Those processes are then organized and reported through the recurring reference "I." The reference is subsequently mistaken for a separate thinker that stood before the process and caused it.*

This appearance prepares the next stage of the architecture. Once the narrator is experienced as the author of thought and action, its identity, continuity, status, and anticipated future can themselves become objects of protection.

Events are then evaluated not only according to their consequences for the organism, but also according to what they imply for the apparent thinker and owner represented as "me."

1.5 The Self Security Loop: Recursive Evaluation and Biological Reinforcement

Once the narrator is experienced as the owner and author of thought, it can also become an object of recursive evaluation. Events are no longer evaluated only according to their immediate consequences for the organism. They are increasingly evaluated according to what they may imply for the continuity, status, security, and anticipated future of "me."

This marks an important extension of organism-relative regulation. A living system must evaluate changes that affect bodily integrity, viability, and possible action. Recursive thought can extend that evaluative architecture to the conditioned self-representation. A remembered failure, anticipated rejection, loss of status, or threat to identity can therefore become biologically significant even when no immediate physical danger is present.

The process does not require an independent self deciding to protect itself. Recursive self-referential evaluation can generate internally produced stimuli. Those stimuli are materially instantiated as thought and can alter attention, autonomic regulation, memory retrieval, bodily tension, and subsequent behaviour [12–15, 21, 22].

Consider a person waiting to learn whether they received a job. No new external event may be occurring, yet the possibility of rejection can be repeatedly evaluated as a threat to security, status, and future identity. Earlier disappointments may be reactivated. Attention may narrow toward signs of failure. Bodily tension and vigilance may increase. Those changes can then make further negative interpretations more likely.

The anticipated event has become an internally generated stimulus. The represented threat may concern a future that has not occurred and an apparent owner whose independent existence is constructed, but the evaluation and its organism-level consequences are physically real [11–13, 16].

> *Put simply, a thought about "me" can become a present stimulus that changes how the organism feels and responds. That changed biological state can then shape what is noticed, remembered, and evaluated next.*

The feedback sequence is therefore recursive. A present event, memory, or anticipated outcome is evaluated in relation to the conditioned self-representation. That evaluation alters the organism's current state. The altered state then becomes new material for further memory retrieval, projection, and self-referential evaluation.

The next cycle does not begin from the same biological conditions as the previous one. Attention may already be narrowed, autonomic arousal elevated, and related memories more accessible. The organism therefore evaluates the next thought or event through a state partly produced by the preceding evaluation.

> *In plain language, the evaluation changes the conditions from which the next evaluation arises.*

This is the basis of the Self Security Loop. A possible threat to "me" produces biological consequences. Those consequences influence what the organism notices, remembers, and anticipates. The resulting thoughts are again organized around the same apparent owner, reinforcing the sense that "I" am the one under threat and must remain protected.

The loop is both reinforcing and sustaining. Each cycle can strengthen the apparent reality and importance of the narrator while also maintaining biological conditions that favour further self-referential processing.

The organism does not consciously reason its way into the apparent division between thought and an independent thinker. Nor does the loop deliberately preserve a fictional self. Its ordinary operation continually renews the division without simultaneously presenting the distributed biological process through which that division is generated.

The result is not intentional concealment. The completed evaluation is experienced as something happening to "me," while the architecture that generated both the evaluation and the apparent owner is not ordinarily represented in the same completed form.

Psychological time supplies the temporal structure of this loop. Retained past is reactivated in the present, and anticipated future is evaluated before it occurs. Friction does not arise from every act of remembering, planning, or imagining. It can increase when recursive evaluation organizes remembered, present, or anticipated content around threat, resistance, contradiction, loss, unresolved comparison, or protection of the conditioned self-representation.

A person can therefore remain biologically engaged with an event that is no longer occurring or has not yet occurred. A remembered humiliation may be repeatedly reconstructed. A possible failure may be rehearsed in advance. An imagined loss may produce present vigilance. Psychological time allows absent events to continue functioning as present biological stimuli [12, 13, 21].

These recursive evaluations can alter metabolic demand, autonomic regulation, network activity, attention, and temporal dynamics [12, 16, 21, 22]. Later sections will examine these measurable dimensions as Friction Signatures. Within the framework, the associated phenomenology is the organism-relative inside view of the same organized process, not a simple conversion of energy expenditure into experience.

The narrator should not be treated as an agent standing outside this process and producing its effects. The narrator is one organization within the same recursive activity. The thought, the attribution to "me," the biological response, and the influence of that response upon subsequent thought all belong to the organism.

The narrator therefore cannot stand outside the process as an independent controller. Asking the apparent controller to control the very process that generates and maintains that controller merely reintroduces the same division at another level.

This does not mean that the organism cannot regulate itself. Attention can shift, responses can be inhibited, evaluations can be revised, and behaviour can change. The point is narrower: no additional inner agent is required to stand apart from these processes and direct them.

The Self Security Loop is therefore not sustained by an independent self attempting to preserve itself. It is sustained by recurrent biological evaluations organized around a self-reference generated within the same process. Each cycle alters the organism and supplies new material for the next, thereby reinforcing and maintaining the apparent continuity, importance, and vulnerability of "me."

The structure of the loop can be stated plainly. A present or imagined event is evaluated in relation to "me." That evaluation changes the organism. The changed organism shapes the next evaluation, which is again organized around "me."

By this stage, the conditioned narrator has become more than a recurring reference for memory and communication. It has become the apparent owner whose status, continuity, and future are repeatedly evaluated and defended. The following section summarizes how this architecture has been constructed and turns to the remaining question: the primary phenomenology that the narrator later claims as its own.

1.6 From the Narrative Self to the Explanatory Gap

The preceding sections have described a continuous developmental and recursive process rather than the appearance of a separate inner entity. Organism-relative registration and valuation are present before the mature narrative self. Memory, social attribution, language, and anticipation then progressively organize changing biological states around a recurring reference expressed as "I," "me," and "mine." [1, 2, 5–7, 9, 10]

Organism-relative reference does not arise as an optional addition to otherwise neutral processing. A living organism has no organism-independent standpoint from which to register bodily state, environmental change, retained history, or possible action. These processes are necessarily organized relative to the condition, regulation, viability, and continued organization of the organism itself.

The organism therefore requires a point of reference. It does not require a separate inner person occupying that reference.

As retained history is reactivated in the present and extended toward possible futures, this organism-relative reference acquires apparent temporal continuity. Different memories, emotions, intentions, and expectations are repeatedly organized as belonging to the same "me." The recurring reference can therefore appear more stable than the changing biological processes through which it is continually renewed.

A further inversion follows. Thought is attributed to the reference as "my thought," and the reference is then experienced as the thinker that produced it. Action is organized in the same way. The organism thinks, evaluates, decides, inhibits, and acts through materially instantiated processes, yet those processes are retrospectively attributed to an apparently separate author.

> *Put simply, the process generates the apparent thinker, and the apparent thinker is then treated as though it stood before the process and directed it.*

Once experienced as author and owner, the narrator also becomes an object of recursive evaluation. Events can now be evaluated not only according to their immediate consequences for the organism, but according to what they imply for the continuity, status, security, and anticipated future of "me."

A remembered failure, an imagined rejection, or a possible future loss can therefore function as an internally generated stimulus. The evaluation alters the organism's present biological state. That altered state then influences attention, memory retrieval, expectation, and the next self-referential evaluation. Through this feedback, the Self Security Loop reinforces both the biological conditions of further recursion and the apparent importance of the narrator around which that recursion is organized [12, 13, 21, 22].

The movement developed across Section 1 can now be stated plainly.

The organism first registers, values, and responds.

Retained biological history allows prior events to shape present processing.

Language and social attribution give the organism-relative reference an explicit name and autobiographical form.

Psychological time links remembered past, present evaluation, and anticipated future around the recurring relation "me."

The reference generated within this process is then experienced as a separate thinker and author.

Once reified as an owner, that reference becomes something whose identity, continuity, status, and future are repeatedly evaluated and defended.

Compressed into a single derivational sequence, the movement is:

retained biological history → present reconstruction and comparison → projection toward possible future → repeated self-indexing as "me" → apparent continuity → virtual reference point → apparent thinker and owner.

The biological process through which this reference is generated and maintained is real. Memory retrieval, valuation, prediction, linguistic representation, self-attribution, autonomic change, and action all depend upon physically instantiated activity within the organism.

The conditioned self is illusory in a precise sense. The illusion does not consist in the absence of self-related processing. It consists in experiencing the recursively renewed reference as an independently existing thinker, controller, witness, and owner standing apart from the biological activity through which it is generated and maintained.

The process is real; the apparent separation is not.

At no stage is an additional inner controller required. Registration, memory, evaluation, self-attribution, intention, and later causal influence all belong to the same organism. The error lies not in organism-relative organization itself, but in reifying the reference generated through that organization as an independent entity.

Section 1 has therefore described how the conditioned narrator develops and how biological events come to be represented as "my thought," "my action," and "my experience." It has not yet explained the primary organism-relative phenomenology already present before those later acts of recognition, attribution, and ownership.

This distinction defines the next stage of the inquiry. The remaining task is to examine the primary biological process itself: the organized activity within the living system whose inside view is phenomenology and upon which later recognition, ownership, and report depend.

The next question is therefore straightforward: what biological organization gives rise to the organism-relative inside view, and how can that organization be identified, constrained, and tested?

The following sections move from the development of the narrator to the biological architecture of phenomenology. They examine the relation between primary organism-relative processing and the later operations through which experience becomes recognized, attributed, organized into autobiography, and reported.

The narrative self is therefore not the final destination of the analysis. Its derivation completes the first stage of the architecture. The investigation can now turn from the construction of the apparent owner to the primary biological event that this narrator later recognizes and claims as its own.

2.0 Defining the Biological Target of Phenomenology

2.1 From the Narrative Self to the Biological Event

Section 1 traced the conditioned narrator to an earlier organism-relative biological architecture. Consequential changes are registered, retained, integrated, and biologically valued before they are recursively organized through memory, language, comparison, and psychological time as events belonging to a persistent "me." The apparent thinker and owner therefore arise within the developing biological process rather than standing before it as an independent source or recipient.

This conclusion removes the narrator from the position it ordinarily occupies in explanations of consciousness. Phenomenology cannot be understood simply as information produced by the brain and delivered to a pre-existing inner subject. The subject that later recognizes an event as "my experience" is itself generated and maintained through recursive relations among memory, valuation, attribution, self-reference, and anticipated consequence.

Narrator-level processing is nevertheless biologically consequential. Once an event is recognized, interpreted, or attributed to "me," that recursive organization can alter attention, autonomic regulation, memory accessibility, valuation, and subsequent perception [12, 14, 15, 21, 22]. The distinction established in Section 1 is therefore not between an active biological event and an inert narrator added afterward. It is between primary organism-relative processing and the secondary recursive organization that can re-enter and modify what follows.

Removing an independent owner does not remove the phenomenon requiring explanation. Before an event is explicitly remembered, named, attributed, or reported, consequential change may already have been registered and integrated within the living organism. The organism's current condition has been altered, biological significance has begun to shape the developing response, and a phenomenal event may already be underway before it is represented as something happening to "me."

The remaining explanatory target is therefore not the narrator but the primary organism-relative biological event and its relation to phenomenology.

The term organism-relative is essential. A living system does not encounter change from a neutral or external reference point. Every consequential event occurs within a bounded organism whose current condition, maintained gradients, regulatory requirements, retained biological history, and available responses influence how that change develops [23, 24].

The same physical disturbance may therefore produce different biological transitions in different organisms or in the same organism under different conditions. A mechanical stimulus may be inconsequential in one state and urgent in another. A change in available energy may be readily accommodated after feeding but significant for regulation during deprivation. The physical input cannot be separated from the condition of the living system in which it is registered [23, 24].

This organism-relative significance does not require a narrator to observe, interpret, or possess the event. Biological valuation precedes reflective judgment. Here, biological valuation refers to organism-relative differential biological treatment and does not imply conscious judgment, representational evaluation, or psychological time. A disturbance may be differentially treated according to its consequences for regulation, integrity, viability, or possible action before it is autobiographically represented as something happening to "me."

The explanatory question can now be stated more precisely. What is the relation between the externally measurable biological event and its organism-relative phenomenal aspect? Does the physical process occur first and then generate an additional phenomenal result, or do the exterior biological description and the organism-relative inside view refer to one organized occurrence under different conditions of access?

Section 2 develops the second possibility. It examines whether phenomenology can be identified as the organism-relative inside view of a bounded biological state-transition rather than as a product added after the biological work has been completed or presented to an internal witness.

This proposal requires careful restriction. It does not identify phenomenology with metabolism in general, energy expenditure alone, every instance of biological regulation, or every physical process occurring within living matter. The proposed identity concerns a constrained class of bounded organism-relative biological state-transitions involving consequential registration, persistence, integration, valuation, temporal development, and resolution into an altered organismic state.

The following subsections develop this architecture in stages. Section 2.2 states the General Organism-Relative Identity Proposition. Section 2.3 clarifies why an inside view does not require an inner observer. Section 2.4 defines the bounded biological state-transition that serves as the mapped unit. The remaining subsections examine its thermodynamic implementation, measurable Friction Signatures, recursive amplification, graded perturbation, empirical limits, and comparative scope.

Section 2 therefore marks the transition from explaining how the apparent owner is generated to identifying the biological event whose organism-relative phenomenal character remains to be explained.

2.2 The General Organism-Relative Identity Proposition

The explanatory problem is commonly framed as a transition between two fundamentally different occurrences. A physical process takes place within the organism, after which subjective experience is presumed to arise as an additional result. The

biological activity belongs to the externally measurable world, while phenomenology appears to occupy a separate interior domain whose connection to that activity remains unexplained [25, 26].

The present framework rejects this two-stage architecture.

For the relevant class of bounded organism-relative biological state-transitions, the measurable biological process and its phenomenology are proposed not as two separate occurrences connected by an unknown conversion, but as externally accessible and organism-relative aspects of one organized event.

This is the General Organism-Relative Identity Proposition.

The proposition can be stated directly:

> **The biological event does not first occur and then produce a second phenomenal event for an observer to receive. Phenomenology is the organism-relative inside view of that same organized biological state-transition.**

The proposition is ontological in scope, not merely a claim that two descriptions happen to correlate. The distinction between the externally measurable event and its inside view arises because the same occurrence is encountered under different conditions of access, not because two independent events occupy separate domains.

From outside the organism, the transition can be investigated through electrical and chemical activity, metabolic demand, temporal organization, regulatory change, perturbational response, and behavioural consequence. For the living system whose condition is being altered, the same organized event possesses an organism-relative phenomenal character.

These access conditions are not interchangeable. An external measurement does not reproduce the organism's inside view for the investigator, just as the inside view does not ordinarily reveal the complete biological mechanism through which the event is enacted. A difference in access or description, however, does not by itself establish a difference in the occurrence being described.

Consider a painful event. Its exterior organization may be investigated through nociceptive signalling, network dynamics, autonomic and regulatory changes, attentional recruitment, protective response, and the alteration of subsequent biological state [27, 28]. Under the identity proposition, pain is not an additional product accompanying that organization. It is the organism-relative inside view of the complete painful state-transition.

The external measurements and the pain are not identical descriptions. They nevertheless refer, under the proposition, to one organized biological occurrence rather than to a physical event followed by the generation of a separate phenomenal result.

> *Put plainly, pain is not added to the biological process and delivered to an inner recipient. The organism undergoes the painful event.*

This formulation requires no internal observer. The phrase inside view does not refer to a smaller subject situated within the organism and watching its biological activity. It refers to the phenomenal aspect of an event enacted within and relative to the bounded organization of the living system whose condition is changing.

The organism does not first process a stimulus and then display the completed result to a witness. Registration, persistence, integration, organism-relative valuation, state alteration, and phenomenal occurrence belong to the same developing biological transition.

Narrator-level processing may subsequently recognize the event as "my pain," compare it with retained history, judge its seriousness, anticipate its continuation, resist it, or prepare a report. Those later operations may modify the organism and contribute further phenomenology, but they should not be mistaken for the occurrence of the primary event.

The identity proposition is therefore stronger than the claim that phenomenology merely depends upon biology. A dependency relation remains compatible with two distinct occurrences: a biological process and a phenomenal result that the process somehow produces, enables, or supports.

The present proposal instead holds that, once the relevant bounded organism-relative biological state-transition has been specified with sufficient completeness—including its temporal development, persistence, integration, valuation, regulatory consequence, and resolution—phenomenology is not a second event still waiting to be generated. It is the organism-relative aspect of the event already described.

This does not mean that any available physical description is necessarily complete. A measurement of neural firing, glucose utilization, local electrical activity, heat production, or autonomic change may capture only one component of the transition. The identity proposition cannot therefore be reduced to the claim that one biological variable is identical with experience.

The proposed identity is between phenomenology and the complete organized event, not between phenomenology and an isolated measurement of that event.

This distinction is essential. If a biological account omits temporal structure, persistence, integration, organism-relative valuation, regulatory consequence, or the relation of local activity to the wider living system, the apparent explanatory remainder may reflect an incomplete description of the event rather than evidence for a separate phenomenal substance or process.

The scientific task is therefore not to discover one signal that converts into experience. It is to identify the complete biological organization whose occurrence is proposed to be phenomenal under organism-relative conditions of access.

For convenience, the manuscript will sometimes refer to these two access conditions as the Grind and the Glow. The Grind denotes the organized biological state-transition as externally measurable. The Glow denotes the organism-relative phenomenal aspect of that same event.

These terms do not identify two interacting entities. Nor does Glow refer literally to metabolic heat, electrical luminosity, or a second substance generated by the Grind. They are shorthand for two conditions under which one biologically instantiated occurrence can be described.

The General Organism-Relative Identity Proposition is introduced here as the central explanatory hypothesis of the framework. Its validity cannot be established by definition alone. The subsequent argument must determine whether the proposed biological target can be bounded precisely, whether its measurable organization changes systematically with phenomenology, whether the relation survives controlled perturbation and comparative analysis, and whether any additional independently instantiated process is empirically required.

Section 2 therefore begins the identity argument rather than completing it. The immediate task is to clarify what is meant by an organism-relative inside view and then to define the biological event to which the proposition applies. Without a bounded and testable mapped unit, the term identity would remain too general to carry scientific weight.

2.3 The Inside View Without an Inner Observer

The term inside view can easily be misunderstood. It may suggest that biological activity occurs in one part of the organism and is then observed by a separate subject located somewhere within it. Such an interpretation would merely relocate the explanatory problem by introducing an internal witness whose own phenomenology would still require explanation.

That is not what the present framework proposes. The inside view is not a representation presented to an observer. It is the organism-relative phenomenal aspect of the organized biological event itself.

The word inside does not refer primarily to spatial location. Countless physical processes occur within the body, but spatial interiority alone does not identify the biological organization proposed to constitute phenomenology. Digestion, cellular repair, molecular synthesis, and regulatory maintenance may all occur internally without thereby satisfying the conditions of the bounded organism-relative biological state-transition defined in this framework.

Inside instead refers to the event as it is enacted within and relative to the bounded organization of the living system whose condition is being altered. Consequential change is registered, retained, integrated, and biologically valued according to its effects upon that organism's existing state and possible responses. The significance of the event is therefore realized through the biological relation between the disturbance and the living system undergoing it.

A tissue-damaging stimulus, for example, is not adequately described as an electrical signal travelling through tissue. It may alter the condition of a particular organism, recruit protective and regulatory processes, redirect attention and action, modify autonomic activity, and reorganize subsequent responsiveness [27, 28]. Its organism-relative significance is expressed in these coordinated consequences rather than assigned by an external observer or an internal narrator.

Phenomenal pain is not then added to this biological organization and delivered to a second entity for inspection. Under the identity proposition, pain is the organism-relative inside view of the organized event. There is no biological pain-process followed by a separate act in which an inner recipient receives its phenomenal product. The organism is the living system undergoing the painful state-transition.

The same distinction applies to perception. Light reflected from an object does not contain phenomenal redness as an independent item awaiting collection by an observer. The physical input alters a living perceptual system whose receptors, prior biological state, discriminatory capacities, maintained gradients, and regulatory organization contribute to how the event develops [29].

The resulting phenomenal colour is not a private image displayed before an internal witness. It is proposed to be the organism-relative aspect of the perceptual state-transition as that transition is enacted within the living system.

The same principle applies to hunger, warmth, fear, bodily orientation, and other phenomenal states. Each depends upon a particular biological organization, but none requires a second subject standing apart from that organization and receiving its result.

This does not make phenomenology impersonal or unrelated to the organism. The event is inherently organism-relative because it occurs through the alteration of a particular living system. Pain concerns the condition of this body; hunger arises within this regulatory state; and perception is structured by this organism's sensory capacities, biological history, and available forms of response.

What is absent is not organism-relative significance. What is absent is the need for an additional owner or witness beyond the organized biological process itself.

The distinction between organism-relative phenomenology and narrator-level ownership is therefore essential. A phenomenal event may occur before it is explicitly recognized, named, compared with retained autobiographical history, or recursively represented as belonging to "me." Those later operations can alter attention, interpretation, memory, valuation, and subsequent biological processing, but they should not be mistaken for the occurrence of the primary event.

A painful sensation, for example, may arise before the organism identifies its source, judges its seriousness, recalls a previous injury, or forms the explicit thought, “This is happening to me.” Later recognition and attribution add further biological and phenomenal organization. They do not establish that the initial pain waited for a narrator before it could occur.

The narrator may subsequently represent the event as “my pain,” but this attribution is a later relation generated within the same organism. It does not reveal an independent subject that existed in advance and received the sensation. The apparent owner is produced through recursive processing of an event already underway.

Primary phenomenology and narrator-level processing should nevertheless not be treated as wholly disconnected. Once recursive attribution occurs, it can feed back into the organism and modify later phases of the event. Naming the pain, anticipating its consequences, remembering a prior injury, or fearing its recurrence can change attention, autonomic regulation, salience, and subsequent phenomenal character [12, 13, 27]. The distinction is therefore functional and architectural, not a claim that the two levels can never interact.

The phrase inside view must also be distinguished from introspection. Introspection is a higher-order activity through which the organism attends to, interprets, categorizes, or reports aspects of its own condition. It presupposes that some biological and phenomenal event is already available for further processing.

Primary phenomenology is not identical to this reflective access. An organism can undergo a state-transition without simultaneously constructing an explicit representation of itself as undergoing that transition. The occurrence of pain, colour, warmth, or bodily disequilibrium does not require the additional thought that such an event is occurring.

Nor is the inside view identical to behavioural or verbal report. Speech, gesture, withdrawal, orientation, and other responses may provide evidence concerning the organism’s state, but they are expressions or consequences of the transition rather than its phenomenal aspect itself.

This distinction becomes particularly important when report is absent or impaired. An organism may lack language, lose motor output, fail to retain an event in memory, or be unable to translate its state into behaviour. None of these limitations alone establishes the absence of primary phenomenology [28, 30, 31].

The identity proposition therefore does not map phenomenology to introspection, verbal report, behavioural output, or the conditioned narrator. It maps phenomenology to the complete organized organism-relative biological event from which those later capacities may receive their content.

The same event can be described externally through its physical implementation. Its organization may be investigated through electrical, chemical, metabolic, temporal, regulatory, perturbational, and behavioural variables. None of these measurements contains a miniature copy of the inside view because the measurement is obtained under a different condition of access.

The absence of pain, colour, fear, or warmth from the investigator’s measurement does not by itself establish that phenomenology is an additional event. The external observer measures the organization from outside the organism, whereas the organism undergoes the state-transition through the biological relations being measured.

An analogy can clarify this distinction without serving as evidence for the identity proposition. A storm may be described through pressure, temperature, wind, and moisture relations. No single measurement constitutes the complete storm, and the storm is not an additional substance inserted after those relations have been organized. It is the bounded physical event jointly described by them.

The biological case includes a further condition not present in the analogy. The state-transition is enacted within a self-maintaining living system for which the disturbance has regulatory and organism-relative consequences. Its inside view is proposed to belong to that organized biological relation, not to a witness positioned behind or beyond it.

The framework therefore rejects a two-entity architecture consisting of a biological process and an observer who receives phenomenology from it. It proposes one bounded organism-relative biological occurrence that may later become the object of memory, interpretation, recursive ownership, introspection, and report.

The next task is to identify the boundaries and organization of that occurrence. Unless the mapped unit is specified carefully, the term inside view could be extended too broadly to every process occurring within biological matter or restricted too narrowly to only those events that become available to narration and report.

Section 2.4 therefore defines the bounded organism-relative biological state-transition to which the identity proposition applies.

2.4 The Bounded State-Transition as the Mapped Unit

The identity proposition cannot be applied vaguely to the organism as a whole or to biological activity in general. A living system contains countless simultaneous processes, many of which are not proposed to constitute the relevant phenomenal event. The explanatory target must therefore be defined as a bounded biological event with an identifiable organization, temporal course, and organism-relative consequence.

The mapped unit proposed here is a bounded organism-relative biological state-transition.

A state-transition begins when a consequential change alters the biological conditions of the organism. The change may originate outside the organism, as in light, pressure, temperature, chemical exposure, or tissue damage. It may also arise internally through interoceptive change, memory activation, anticipation, or ongoing regulatory activity [23, 24].

The initiating disturbance alone does not constitute the complete event. It must be registered by a biological system capable of being altered by it. Registration may involve receptor activation, membrane-potential change, chemical signalling, neural activity, or another substrate-specific mechanism.

Local detection, however, is not yet organism-level resolution.

A receptor can respond to stimulation without the event becoming integrated into the wider biological organization of the organism. Signals may remain local, decay before reaching a relevant threshold, be inhibited, or fail to alter regulation, action, or the organism's ongoing state.

This distinction is essential. The identity proposition does not apply merely because some component of a living system has reacted. The proposed mapped unit is instead the organized transition through which a consequential disturbance becomes integrated into the condition and activity of the organism.

The event therefore develops across time. The biological effects of the disturbance must persist long enough to interact with other conditions within the living system. Incoming activity may be accumulated, integrated with the organism's ongoing state, modulated by retained biological history, or differentially processed in relation to regulatory requirements before a consequential transition becomes possible.

Persistence need not take the form of conscious memory or narrative recall. It may consist in temporarily altered electrical, chemical, metabolic, synaptic, or regulatory conditions. What matters is that the effects of an earlier change remain biologically available to influence the developing event.

Integration refers to the coordination of local activity with the wider condition of the organism. The significance of a signal depends not only upon its physical properties but also upon the biological conditions into which it arrives.

The same external stimulus may produce different transitions depending upon the organism's current state. A sound may be ignored in one condition and treated as urgent in another. A reduction in available energy may be insignificant after feeding but consequential during deprivation. A bodily signal may acquire greater priority when it coincides with previous injury or anticipated danger [23, 24].

The event is therefore organism-relative not because a narrator interprets it, but because its biological consequences depend upon the existing organization, needs, and possible responses of the living system.

Valuation refers here to the organism-relative differential biological treatment of a disturbance according to its relation to the organism's current condition and organization. The term does not imply reflective judgment, conscious preference, or verbal assessment. It refers more fundamentally to the differential treatment of conditions according to their consequences for regulation, viability, integrity, or possible action.

A change may recruit approach, withdrawal, inhibition, orientation, repair, defence, consumption, or another form of biological adjustment. Through such differential organization, the event becomes consequential for the organism rather than remaining a physically detected but biologically unresolved disturbance [24, 27, 28].

The state-transition reaches resolution when the accumulated and integrated process produces a sufficiently definite alteration in the organism's regulatory, perceptual, affective, or behavioural state.

Resolution does not necessarily mean that the disturbance has been eliminated. It means that the organism has entered a new organized condition in relation to it.

A painful event may resolve into withdrawal, protective regulation, heightened attention, and retained sensitivity. A perceptual event may resolve into a differentiated phenomenal state and an altered readiness to act. An internally generated threat may resolve into sustained vigilance rather than immediate movement.

The resolved state may itself remain unstable and initiate further transitions. Biological processing is recurrent, and the boundary of one event may become the starting condition of the next. Boundedness therefore does not imply that living activity occurs as a sequence of perfectly isolated units.

It means that a particular transition can be identified by its initiating conditions, developing organization, threshold relations, altered state, and consequences.

A useful general sequence is:

consequential change
→ biological registration
→ persistence and integration
→ organism-relative valuation
→ state alteration or resolution

This sequence is not intended as a rigid linear pipeline. In living organisms, its components may overlap, recur, and influence one another. Registration can alter valuation; valuation can redirect integration; an emerging response can modify the input; and the resolved state can generate new stimulation.

The sequence identifies the functional relations that define the event, not a claim that each stage occupies a completely separate interval or structure.

The distinction between detection and resolution also prevents behavioural output from being mistaken for the phenomenal event. An observable response may provide evidence that a transition occurred, but the behaviour is not identical to the entire process that produced it.

Withdrawal from a harmful stimulus, for example, does not by itself establish the full phenomenal character of the event. The response is one consequence of registration, integration, valuation, and organism-level reorganization.

Conversely, the absence of an overt response does not necessarily demonstrate the absence of the event. Motor output may be inhibited, disconnected, unavailable, or unnecessary even when substantial organism-relative processing remains intact [28, 30, 31].

This is why the mapped unit cannot be defined solely through behaviour or report. It must be identified through convergent evidence concerning the underlying organization and its temporal development.

The identity proposition applies to the complete bounded transition rather than to any isolated component. A receptor potential, metabolic increase, neural discharge, autonomic response, or behavioural act may form part of the event, but none is sufficient by itself to constitute the mapped unit.

The relevant biological process is the organized relation among these components as consequential change is taken up into the living system and resolved according to that system's condition.

This formulation also establishes the level at which comparative analysis becomes possible. Different organisms may implement registration, persistence, integration, valuation, and resolution through very different biological structures. The identity proposition does not require those implementations to be anatomically identical.

What must be compared is the organization of the state-transition, not superficial similarity of substrate or behaviour.

A human perceptual transition, an animal threat-related state-transition, and a plant thresholded state-transition may differ greatly in complexity, differentiation, temporal depth, integration, and behavioural flexibility [41]. Those differences matter. They do not, however, prevent the framework from asking whether selected relations within a more general organism-relative architecture are conserved across them.

That comparative question will be developed later. At this stage, the purpose is narrower: to define the event whose exterior organization and organism-relative inside view are proposed to be identical aspects of one biological occurrence.

The mapped unit is therefore not an isolated signal, a total energy value, a behavioural output, or a narrated report. It is the bounded trajectory through which consequential change becomes registered, integrated, valued, and resolved within the living organism.

The next section examines the physical implementation of this trajectory and explains why the identity proposition depends upon biological organization rather than energetic magnitude alone.

2.5 Biological Organization, Not Energy Magnitude Alone

The bounded state-transition identified in Section 2.4 is a physical event. Its occurrence depends upon metabolic work, maintained electrochemical gradients, chemical signalling, membrane dynamics, regulatory activity, and the irreversible dissipation of energy [32–35]. An organism cannot register, retain, integrate, value, or resolve consequential change without materially instantiated processes capable of altering its state. Thermodynamic implementation is therefore indispensable to the organism-relative identity proposition.

A living organism is not an equilibrium structure. It maintains its organization through continual exchanges of matter and energy with its environment, the preservation and restoration of gradients, the repair of disruption, and the regulation of internal conditions against ongoing leakage and perturbation. Biological responsiveness is possible only because this active organization is continuously sustained [32].

A sensory receptor, neural network, cellular signalling pathway, or distributed regulatory system cannot preserve its functional capacity without energetic support. Electrical and chemical gradients must be established and restored; molecular configurations must change; signals must propagate, decay, or be actively terminated; and competing processes must be recruited or inhibited. Every transition therefore carries a physical cost [33–35]. The organism-relative event is inseparable from thermodynamic work.

This necessity does not imply that phenomenology can be identified with energy expenditure considered in isolation. Many biological processes consume substantial energy without entering the organism's phenomenal condition in the same way as perception, pain, anxiety, or bodily sensation. Digestion, tissue maintenance, immune regulation, protein synthesis, and cellular repair all require metabolic work. Their energetic cost alone does not establish that each process constitutes the relevant bounded event or possesses the same relation to phenomenology.

Equal quantities of energy can also support markedly different biological operations. Similar total metabolic expenditure may be distributed across different tissues, cellular populations, regulatory pathways, temporal patterns, or forms of organism-level coordination. A single measure of energy use cannot specify what change is being registered, how that change is integrated with the organism's condition, what biological consequence it carries, or which state-transition is being resolved [33–35, 42].

The identity proposition therefore concerns organized biological work rather than energetic magnitude alone. What matters is not simply how much energy is consumed, but how that work is distributed and coordinated within the living system.

The relevant organization includes the spatial distribution of activity, the temporal sequence through which the event develops, the persistence of earlier changes, the integration of local signals with the wider organismic condition, the biological valuation of the disturbance, the regulatory systems recruited, the alternatives facilitated or inhibited, and the altered state into which the organism transitions. These dimensions jointly define the bounded event. Total energy expenditure is one property of that event, but it does not exhaust its organization.

Consider two biological conditions requiring similar metabolic expenditure. One might involve sustained muscular regulation during physical effort, while another involves the recursive evaluation of anticipated social threat. Their total energetic demands could overlap even though their spatial distribution, temporal dynamics, regulatory consequences, behavioural implications, and phenomenal character differ substantially.

The reverse relation is also possible. A comparatively small energetic change may participate in a phenomenally significant state-transition when it occurs within a highly organized and biologically consequential process. A slight variation in sensory input may sharply alter perception if it changes the integrated condition of a system positioned near a discrimination or response threshold. The relevance of the change depends upon its place within the organized state-transition rather than upon its energetic magnitude considered independently.

Phenomenal intensity therefore cannot be assumed to increase in direct proportion to total metabolic demand. Greater energetic expenditure may accompany greater intensity in some conditions, particularly where stronger, wider, or more sustained biological recruitment is required. Even in such cases, however, the relation is mediated by organization. Energy may be expended upon amplification, inhibition, restoration, prediction, motor preparation, autonomic regulation, or background maintenance without each contribution appearing as an equivalent increase in phenomenal intensity.

The framework must therefore distinguish at least three questions: whether a phenomenal event is present, what qualitative character it possesses, and how strongly, clearly, or saliently it is expressed. These dimensions may depend upon overlapping biological processes without varying together along one linear energetic scale.

Anxiety illustrates this distinction. A sustained anxiety state may involve prolonged autonomic recruitment, narrowed attention, repeated memory activation, future-oriented projection, and recursive self-referential evaluation. Its metabolic and regulatory demands may exceed those of a brief neutral perception [12, 13, 16, 21, 22]. This does not mean that anxiety contains more consciousness in every relevant sense. It means that the organism is sustaining a differently organized and more temporally extended state-transition with its own physiological and phenomenal structure.

Some forms of meditation provide the complementary case. Recursive self-referential activity and its associated regulatory demands may decline while perceptual clarity, bodily sensitivity, or phenomenal vividness remains stable or increases [36, 37, 43]. The biological organization has changed, but the difference cannot be described adequately as either a simple increase or decrease in energy use.

These examples show why the identity proposition must be multidimensional. The externally measurable event includes energetic expenditure, but it also includes the spatial, temporal, regulatory, and relational organization through which that expenditure is deployed. Phenomenal differentiation is therefore expected to correspond to differences in the complete biological trajectory rather than to one metabolic total.

A visual event, a painful sensation, and an anticipated threat recruit different forms of registration, persistence, integration, valuation, and resolution. Their phenomenal differences should correspond to differences in the organization of those processes, including where activity occurs, how it develops over time, how it affects the organism's regulatory condition, and how it relates to the organism's prior state and available responses.

This claim does not yet specify a complete mapping between biological organization and qualitative phenomenal character. That task requires the later formal development of the Mapping Theorem. The more limited claim established here is that qualitative variation cannot be accounted for by energetic magnitude alone.

The same caution applies to heat production, entropy production, and irreversible dissipation. Every living process dissipates energy, but dissipation by itself is not the mapped unit [32]. A chemical reaction, a flame, and a living organism may all release heat and move irreversibly away from an earlier condition. Their shared thermodynamic properties do not erase the differences in how those processes are bounded, regulated, historically conditioned, or organized relative to the continued state of a living system.

The proposed mapped unit is therefore a bounded biological process in which consequential change is registered, retained, integrated with the organism's current condition, biologically valued, and resolved through an organized state alteration. Thermodynamic dissipation makes such a process physically possible, but dissipation without the relevant organization is insufficient.

The framework therefore does not claim that heat becomes experience. It proposes that phenomenology is the organism-relative inside view of a specifically organized biological event and that the enactment of such an event necessarily requires thermodynamic work.

This distinction clarifies the importance of maintained biological gradients. Living systems preserve differences in electrical potential, ion concentration, chemical availability, pressure, temperature, and molecular distribution. These nonequilibrium conditions allow disturbances to be registered and propagated rather than immediately disappearing into an undifferentiated equilibrium state [32–35].

When consequential change disturbs the system, energetic work is required both to enact the developing response and to restore or reorganize the conditions upon which future responsiveness depends. Gradients must be replenished, molecular states reset, signalling pathways terminated or reconfigured, and regulatory variables returned to a viable range or established at a newly altered level.

The framework later refers to the continuous ATP-dependent maintenance, restoration, and reorganization of these gradients under conditions of noise, leakage, and perturbation as the Stochastic Pump. At this stage, the Stochastic Pump is not presented as a completed mathematical mechanism or as an independent explanation of phenomenology. Its relevance is more basic: organism-relative state-transitions can occur only within a living system that continually sustains the physical differences upon which registration, propagation, persistence, integration, and resolution depend.

The biological event is therefore both materially embodied and organizationally specific. These two descriptions should not be separated into an abstract informational architecture on one side and an incidental biological energy supply on the other. The process is enacted through the material gradients, constraints, delays, thresholds, regulatory histories, and response capacities of the organism itself.

The physical medium matters because it participates in determining what changes can be registered, how long their effects can persist, which signals can interact, what thresholds can be crossed, and how the organism can reorganize its subsequent state. Biological implementation is therefore constitutive of the event rather than merely a source of power supplied to an otherwise complete abstract computation.

Material embodiment does not require one anatomical substrate to possess a monopoly upon the relevant organization. Different organisms may coordinate bounded state-transitions through neural, cellular, chemical, electrical, mechanical, or hydraulic mechanisms. Their implementations may differ substantially while remaining subject to general requirements of energetic maintenance, temporal persistence, organism-relative integration, biological valuation, and consequential resolution.

The identity proposition is therefore neither substrate-independent in the sense of ignoring physical implementation nor substrate-exclusive in the sense of requiring one particular anatomy. It is materially embodied and organizationally constrained.

This formulation establishes a specific relation among biology, thermodynamics, and phenomenology. Biological organization defines the relevant bounded event. Thermodynamic work enacts, maintains, and resolves that organization. Phenomenology is proposed as the organism-relative inside view of the same event.

The next task is to determine how the externally accessible organization of such events can be measured. No single metabolic value, temperature change, electrical signal, or behavioural response will be sufficient. What is required is a convergent profile of the energetic, temporal, integrative, and regulatory changes through which the bounded state-transition develops.

The framework refers to these measurable exterior expressions as Friction Signatures.

2.6 Friction Signatures as Measurable Access

If phenomenology is the organism-relative inside view of an organized biological event, that same event must also possess an externally accessible physical organization. The inside view cannot be directly observed from the position of an external investigator, but the biological event has externally measurable biophysical expressions. The framework refers to these expressions as Friction Signatures.

A Friction Signature is a measurable biophysical expression of the work, coordination, constraint, and state-change involved in a bounded organism-relative event. It may be expressed through changes in metabolism, heat production, electrochemical activity, network coordination, temporal dynamics, autonomic regulation, or the restoration and reorganization of biological gradients following perturbation.

The term friction is not intended literally. It does not refer to mechanical rubbing, nor is it restricted to psychological conflict, stress, or pathology. It denotes the physical demand generated as a living system registers consequential change, integrates that change with its existing condition, recruits regulatory resources, and undergoes an organized state-transition.

Every such transition must be materially implemented. Electrochemical gradients are disturbed and restored, chemical concentrations change, signals propagate and decay, competing responses are facilitated or inhibited, and regulatory systems are recruited. Energy is dissipated as the organism moves from one organized condition to another [32–35]. These measurable changes provide an exterior trace of the event.

The central relation can therefore be stated directly:

> **The organism-relative inside view is phenomenology.**
>
> **The externally measurable biophysical expression of the same organized process is its Friction Signature.**

This relation does not mean that the signature is a second event caused by phenomenology, or that phenomenology is produced by the signature. Both belong to the same biological occurrence described under different conditions of access.

A Friction Signature is therefore not itself what the event feels like. A measurement of glucose utilization, electrical activity, blood flow, heat production, or autonomic change does not contain pain, colour, fear, warmth, or anxiety. It measures one or more physical dimensions of the biological organization whose organism-relative aspect is proposed to be phenomenal.

This distinction prevents two common errors. The first is to treat a measurable biological variable as though it were the experience itself. The second is to assume that, because an external measurement does not reproduce the organism's inside view for the investigator, the measurement and the phenomenology must belong to separate events.

Neither conclusion follows. Difference in access does not establish difference in occurrence.

At the same time, no isolated measurement is sufficient to specify the complete mapped event. A rise in temperature, a shift in electrical power, or an increase in blood flow may identify physical demand without revealing how the event is temporally organized, integrated with the organism's condition, biologically valued, or resolved. Friction Signatures must therefore be treated as multidimensional.

A metabolic signature may include changes in ATP demand, glucose utilization, oxygen consumption, lactate production, or regional blood flow [33–35, 42]. These measures indicate where and to what degree energetic resources are recruited, but they do not independently reveal how that work is organized.

A thermodynamic signature may include local heat production, entropy production, irreversible dissipation, or departure from equilibrium [32, 44]. Such measures identify energetic consequences of state-change, but dissipation alone cannot distinguish an organism-relative event from unrelated biological maintenance.

An electrical or network signature may include altered oscillatory activity, effective connectivity, signal propagation, synchronization, differentiation, or recurrent interaction among distributed biological components [38, 39]. These measures provide information about how activity is coordinated across space and structure.

A temporal signature may include onset, duration, accumulation, recurrence, delay, recovery, or persistence after the initiating stimulus has disappeared. These measures help identify the bounded trajectory of the event rather than reducing it to a static quantity.

An autonomic or regulatory signature may include changes in heart rate, heart-rate variability, respiration, skin conductance, vascular tone, endocrine activity, muscle tension, or other organism-level adjustments [12, 24]. Such measures indicate that the event has altered the regulatory condition of the organism rather than remaining confined to isolated local activity.

No single category provides a complete account. The evidential strength arises from convergence among multiple dimensions of the same bounded event.

If metabolic demand changes without corresponding alteration in temporal organization, integration, valuation, or regulatory consequence, the change may reflect energetic expenditure unrelated to the mapped phenomenal process. If local electrical activity occurs without organism-level integration or resolution, it may indicate detection without the complete transition. If behavioural output changes while the underlying biological organization remains intact, the alteration may concern expression rather than phenomenology.

The relevant Friction Signature is therefore the convergent profile formed by multiple measurements of the same event. The framework does not seek a single consciousness meter. It seeks an organized biological pattern whose measurable dimensions change systematically with the organism-relative state under investigation.

This approach also explains why Friction Signatures may differ substantially across organisms. A human nervous system, a plant signalling network, and a single cell do not implement registration, persistence, integration, valuation, and resolution through identical structures. Their measurable signatures may therefore differ in scale, speed, complexity, and biological medium [41].

What remains potentially comparable is not a particular anatomical marker but the organization of the event: a disturbance is registered; its consequences persist; activity is integrated with the current condition of the organism; biological significance alters the developing response; a threshold, commitment, or regulatory transition is reached; and energetic work restores or reorganizes the system.

The physical expression of this organization will depend upon the substrate through which it is enacted.

Substrate sensitivity does not weaken the identity proposition. It prevents the framework from treating one human neural marker as the universal measure of phenomenology and from interpreting its absence in another organism as evidence that the more general organization is absent.

Substrate variation does not, however, permit the theory to become unconstrained. A proposed Friction Signature must be tied to an identifiable biological mechanism, a bounded event, and a measurable alteration in the organization of the living system. Superficial behavioural resemblance, metabolic activity in general, or the mere presence of feedback is insufficient.

Friction Signatures therefore serve both a constructive and a restrictive role. They provide empirical access to the externally organized event, while also requiring the framework to specify which biological dimensions should change, when they should change, and how those changes should relate to alterations in phenomenal presence, character, ownership, and reportability.

Several perturbational conditions illustrate this methodological role.

In a recursively sustained state of anxiety, the relevant evidence extends beyond the verbal report "I feel anxious." The framework predicts a temporally prolonged biological trajectory involving internally generated stimulation, memory recruitment, altered attention, autonomic regulation, self-referential evaluation, and sustained regulatory demand [12, 13, 16, 21, 22].

In meditative or related attenuation of self-referential processing, the relevant question is not simply whether a person reports feeling calm. It is whether narrator-level recursion, autobiographical evaluation, and associated regulatory demand are reduced while primary sensory, bodily, or affective phenomenology remains available [36, 37, 43].

General anesthesia provides a different perturbation. The relevant comparison is not merely between movement and immobility, but between changes in integration, effective connectivity, temporal complexity, organism-level availability, and the loss and recovery of reportable phenomenology [38–40].

These conditions are developed more fully in Sections 2.7 and 2.8. Their role here is to show that different perturbations alter different components of the architecture and can therefore help separate phenomenal presence from narrative ownership, behavioural output, metabolic magnitude, and reportability.

Friction Signatures also permit a distinction between transient biological demand and sustained recursive load. A brief perceptual event may involve rapid registration, integration, valuation, and resolution. Its measurable profile may be temporally brief, spatially restricted, and closely coupled to the initiating stimulus.

A recursively sustained event may continue after the external stimulus has ended. Retained history, anticipation, comparison, or self-security evaluation may repeatedly reactivate the process. Its signature may therefore include recurrent recruitment, greater temporal persistence, broader regulatory consequences, and increased cumulative metabolic demand [12, 13, 16, 21].

The difference is not simply that one event uses more energy. It lies in how the event is organized and sustained.

This distinction is particularly important in psychological suffering. An external threat may be brief, while memory and anticipated consequence continue to stimulate the organism. The resulting friction is not unreal because its representational content concerns the past or future. The self-referential evaluation is itself a physically instantiated present event with measurable biological consequences [12, 13, 16, 21, 22].

The organism-relative inside view of such a sustained process may include anxiety, fear, tension, uncertainty, or distress. Its Friction Signature is the externally measurable profile of the biological organization through which those states are maintained.

The identity proposition predicts systematic correspondence between changes in the organized biological process and changes in its organism-relative inside view. This does not imply that every measure will vary in the same direction, that phenomenal intensity will scale linearly with energy expenditure, or that qualitative character can be inferred from one biological quantity.

Some variables may increase while others decrease. Greater local inhibition may require increased energy while reducing wider propagation [34]. Reduced narrative recursion may lower activity in one distributed system while increasing sensory differentiation elsewhere. Behavioural response may disappear despite preserved internal processing [30, 31, 39].

The empirical task is therefore to identify the complete pattern rather than selecting whichever isolated measure appears to support the proposal.

A scientifically useful Friction Signature should satisfy several preliminary conditions. It should be associated with a clearly bounded biological event, connected to a plausible mechanism of registration, persistence, integration, valuation, or resolution, and responsive to controlled amplification, attenuation, disruption, or restoration of that mechanism. It should also be distinguishable from unrelated metabolic, regulatory, or behavioural activity.

Where first-person or behavioural evidence is available, the signature should exhibit systematic alignment with changes in phenomenal presence, character, intensity, ownership, memory, or reportability. No single condition establishes identity. Together, however, they progressively constrain the class of biological processes capable of serving as the mapped target.

This is the empirical value of Friction Signatures. The identity proposition does not require the external observer to measure phenomenology as though it were a separate substance. It requires the observer to identify the organized biological event, perturb its relevant components, track its multidimensional physical expression, and determine whether changes in that organization align with changes in the organism-relative state.

The later Mapping Theorem develops this relation more formally by specifying the biological variables, organizational constraints, and mapping conditions through which the exterior description and organism-relative inside view can be related without introducing an additional observer, translator, or phenomenal substance.

The claim at this stage is more limited. Friction Signatures provide measurable access to the externally organized biological process, while phenomenology is proposed as the organism-relative inside view of that same process. The evidential question is whether the physical signatures and phenomenal condition vary together in the structured manner predicted by the identity proposition.

Section 2.7 returns to the human organism and examines how the recursive architecture developed in Section 1 can amplify and prolong these state-transitions. Anxiety provides a particularly useful diagnostic case because retained history, anticipated consequence, self-referential valuation, autonomic change, and continued biological stimulation can be traced within one recurrent process.

2.7 Recursive Amplification in the Human Organism

The organism-relative identity proposition concerns primary biological events before they are recognized, interpreted, or owned by the conditioned narrator. In the human organism, however, many such events do not end with their initial resolution. Memory, anticipation, language, comparison, and self-referential evaluation can reactivate and reorganize what has occurred, producing additional biological state-transitions whose consequences become part of the conditions governing subsequent processing.

The recursive architecture developed in Section 1 therefore does not create phenomenology from an otherwise non-phenomenal process. It modifies an already occurring organism-relative event and generates further biological activity whose inside view

contributes to the developing phenomenal state. This distinction is essential: narrator-level interpretation is consequential without being the source of primary phenomenology.

A sensory or interoceptive change may initially be registered and valued through primary organism-relative processing. The event may then become available to retained history, categorization, prediction, and narrator-level attribution. Once represented as something happening to "me," its possible implications for safety, identity, status, control, or future condition can themselves become sources of biological stimulation.

The later evaluation does not travel backward and generate the original event. It changes the biological conditions from which subsequent perception, feeling, thought, and action arise. The process is therefore recurrent rather than simply linear:

```
primary registration and valuation
→ memory, interpretation, and attribution
→ internally generated stimulation
→ altered organismic state
→ modified subsequent registration and valuation
```

Each cycle contributes to the conditions governing the next. A primary event influences recursive evaluation; recursive evaluation changes the organism; and the altered organism encounters or generates the next event from a different biological state.

Psychological time provides the structure through which this amplification occurs. It does not require explicit thought about the chronological past or future. Retained biological history is active within present conscious thought whenever the organism recognizes, compares, interprets, evaluates, reconstructs, or projects from its current condition. This organization allows present processing to incorporate what has occurred previously, what the current event is taken to mean, and what may happen later [9, 10].

A remembered event is not inspected as an inert record. Its reactivation is a present biological occurrence capable of recruiting attention, altering autonomic regulation, changing muscle tension, redirecting perception, increasing vigilance, and modifying the accessibility of related memories. An anticipated event is likewise not physiologically empty merely because it has not occurred. A projected injury, rejection, loss, or failure can function as an internally generated stimulus that changes the organism's present state [12, 13, 21, 22, 56, 57].

The organism can therefore respond in the present to content derived from retained history or projected possibility. This capacity is not inherently pathological. It supports learning, preparation, planning, delayed action, social coordination, problem-solving, and avoidance of previously encountered danger. The ability to carry prior consequences forward and evaluate possible futures provides substantial adaptive flexibility [9, 10].

Recursive amplification becomes frictionally costly when processing remains organized around unresolved threat, contradiction, resistance, comparison, or protection of the conditioned self-representation. The event may then be repeatedly evaluated through questions concerning what it means for "me," whether it will happen again, how it might be prevented, what it implies about identity, how others may respond, or what consequences may follow.

These relations need not appear explicitly as verbal questions. The same architecture can be enacted through imagery, bodily anticipation, affective tension, attentional bias, or non-verbal expectation. What matters is that the developing event is repeatedly evaluated in relation to retained biological history and the apparent continuity of the conditioned "me."

Anxiety provides a particularly clear example. Immediate external danger can produce rapid organism-relative valuation and protective response. In anxiety, however, the relevant threat may be uncertain, temporally displaced, internally generated, or repeatedly reconstructed.

A present cue may activate retained biological history, and that history may alter how the cue is evaluated. The evaluation can then be extended into an anticipated future in which a possible outcome is represented as threatening to the organism or conditioned self. This projection changes the organism's current condition: attention may narrow, autonomic arousal may increase, respiration and muscle tension may change, threat-related memories may become more accessible, and ambiguous information may be interpreted as further evidence of danger [11–13, 21, 22, 56, 57].

The altered organism then provides input to the next recursive cycle. Bodily tension may be noticed and interpreted as confirmation that something is wrong. That interpretation produces additional stimulation, which may increase the tension and strengthen the apparent credibility of the threat. The process becomes self-reinforcing as possible threat activates retained history, retained history shapes future projection, projection alters present biology, and the resulting biological state biases subsequent perception and thought toward renewed threat evaluation.

The external situation may remain unchanged while the recursive process continues to generate new organism-relative events. This does not make the anxiety unreal or merely imaginary. Its representational content may concern an event that has not occurred, but the evaluation itself is materially instantiated. Its autonomic, metabolic, attentional, and regulatory consequences occur within the organism in the present [12, 13, 16, 21, 22]. The represented threat may be virtual; the biological response is not.

The corresponding phenomenal state is equally real. Under the identity proposition, anxiety is the organism-relative inside view of this sustained and recursively organized biological trajectory. It is not an additional feeling attached to the process after the metabolic and regulatory work has taken place.

Anxiety is also not reducible to any single physiological variable. Changes in heart rate, respiration, heart-rate variability, muscle tension, endocrine activity, network recruitment, and memory activation may each contribute to its externally measurable Friction Signature [12, 16, 21, 22]. None alone constitutes the complete event. The relevant state lies in their organized relation as the organism repeatedly registers, evaluates, anticipates, and responds to the represented threat.

The role of the conditioned narrator must therefore be specified carefully. The narrator is not an independent agent operating the anxiety mechanism. It is the recursively maintained reference around which memory, anticipation, threat, and ownership are organized. The organism does not first contain a separate "me" that subsequently becomes anxious. The biological process generates and renews the self-reference through which the developing state is interpreted as "my anxiety," "my danger," or "my uncertain future."

That attribution can itself provide additional stimulation. Concern about being anxious may become part of the anxiety. Fear of losing control may intensify monitoring, while the demand to eliminate the state immediately may introduce resistance to sensations already occurring. The recursive audit can therefore take the consequences of its own activity as new input.

This helps explain why the process may persist after the initiating event has disappeared. Each cycle produces biological and representational conditions capable of contributing to the next. Continuous external stimulation is no longer necessary because the organism's altered state, retained history, anticipated consequences, and self-referential evaluation can provide internally generated stimulation [12, 13, 21].

The Self Security Loop described in Section 1 is the specifically human expression of this recurrent organization. A present event is evaluated in relation to the conditioned self-representation, and that evaluation changes the organism. The altered condition then influences the next perception, memory, and projection, which are again organized around the same self-reference.

This loop reinforces both the biological conditions supporting continued recursion and the appearance that a separate owner remains continuously present. Because successive states are attributed to "me," the narrator appears increasingly stable and consequential. At the same time, the biological effects of that attribution sustain conditions under which further evaluation and ownership can occur.

Recursive amplification should not be interpreted as a simple increase in the quantity of phenomenology. Anxiety does not necessarily produce more phenomenology in every respect than direct perception or less recursive awareness. It produces a differently organized phenomenal state characterized by temporal extension, threat valuation, bodily preparation, attentional narrowing, and intensified self-related ownership.

Some perceptual information may become less differentiated as attention contracts around anticipated threat. Narrative activity may increase while engagement with immediate sensory conditions decreases. Metabolic and autonomic demand may rise even as the range of available phenomenal content becomes narrower. The relation is therefore organizational rather than merely quantitative.

Recursive amplification may alter the event's duration, the salience assigned to particular stimuli, the accessibility of related memories, the degree of autonomic and metabolic recruitment, the breadth of attention, the intensity of self-related ownership, and the qualitative character of the resulting phenomenal state. These changes should correspond to alterations in the event's multidimensional Friction Signature [12, 13, 16, 21, 22, 56].

A brief external threat and a prolonged episode of anticipatory anxiety may recruit some overlapping biological systems, but their temporal and regulatory profiles should differ. The externally initiated event may resolve when the danger passes, whereas the recursively sustained state may continue through repeated memory activation, future projection, and self-referential evaluation. Its cumulative biological cost may therefore arise not only from the intensity of individual responses but also from their repeated reinstatement over time [12, 13, 16].

In this context, friction does not denote the energetic cost of biological processing in general. It denotes the additional and sustained demand produced when psychological time repeatedly reorganizes present processing around unresolved implications for the conditioned self.

The same architecture may operate in rumination, resentment, shame, envy, regret, and prolonged social threat. Although their contents differ, each may involve the reactivation of retained history, evaluation in relation to "me," projection of possible consequences, alteration of the organism, and renewed processing from the resulting biological state [12, 13, 21].

The framework does not claim that all human thought is pathological or that every use of memory and anticipation produces destructive friction. The relevant distinction is whether recursive processing reaches an effective resolution or repeatedly regenerates the conditions of its own continuation. Planning may terminate in a selected course of action, reflection may result in learning or revised behaviour, and a remembered event may be integrated without remaining an active threat.

Friction becomes sustained when the process repeatedly returns to unresolved comparison, avoidance, control, contradiction, or protection of the self-representation without reaching a sufficiently stable biological or behavioural resolution. Resolution here does not imply complete emotional closure; it denotes a state alteration that no longer continually reinstates the same recursive demand.

The organism can nevertheless regulate and alter this process. Attention may shift, interpretation may change, action may reduce uncertainty, and autonomic or environmental conditions may be modified. None of these capacities requires an independent controller standing outside the loop. Regulation is performed by the same organism whose recursive organization generates the apparent controller.

Recursive amplification is important to the identity proposition for two related reasons. First, it explains how narrator-level processing can produce real organism-level biological and phenomenal consequences without being the source of primary phenomenology. Second, it provides an extended condition in which the organization of the event can be examined empirically across time.

Internally generated stimulation can maintain the trajectory beyond the disappearance of its external trigger, producing measurable metabolic, autonomic, temporal, and network consequences that can be compared with changes in anxiety, salience, ownership, and reported suffering [12, 13, 16, 21, 22]. Anxiety therefore functions as more than an illustration. It provides a diagnostic case of the feedback relation between primary organism-relative processing and secondary recursive organization.

The initiating event is registered by the organism. The recursive audit interprets and projects it through psychological time. That evaluation provides new stimulation, the organism changes, and the changed state influences the next cycle. The developing phenomenal state is the organism-relative inside view of this continuing biological trajectory.

Section 2.8 broadens this perturbational logic. If recursive organization can amplify and prolong the event, then selective attenuation, structural distortion, broad suppression, and subsequent restoration should produce correspondingly different changes in phenomenal presence, character, ownership, and reportability. These graded perturbations provide an initial empirical test of the organism-relative identity proposition.

2.8 Graded Perturbation: Amplification, Attenuation, Distortion, and Suppression

The organism-relative identity proposition makes an empirical commitment. If phenomenology is the organism-relative inside view of an organized biological event, systematic alteration of that organization should correspond to systematic alteration of the organism-relative phenomenal state.

This relation cannot be tested adequately by asking only whether a person is conscious or unconscious. Both biological and phenomenal organization vary across several partially separable dimensions. A perturbation may alter whether phenomenology is present, the qualitative character or intensity of an event, its temporal persistence, its integration with other contents, its attribution to “me,” or its availability for memory, behaviour, and report.

These dimensions must not be treated as interchangeable. Phenomenal presence concerns whether an organism-relative inside view occurs. Phenomenal character concerns the differentiated form of the event, such as pain, colour, anxiety, bodily dislocation, or perceptual clarity. Phenomenal intensity concerns its strength, salience, or urgency. Narrative ownership concerns whether the event is recursively represented as happening to “me,” while reportability concerns whether it becomes available for behavioural or linguistic expression.

A biological perturbation may affect one of these dimensions more strongly than another. Reduced narrative ownership does not necessarily imply reduced phenomenal presence. Loss of motor report does not establish the loss of phenomenology. Increased metabolic demand does not necessarily imply greater phenomenal richness [30, 31, 36, 37, 39, 43, 45]. The empirical task is therefore to identify which component of the architecture has been altered and which phenomenal dimension changes with it.

The conditions considered below provide four complementary classes of perturbation: recursive amplification, selective attenuation, distortion or fragmentation, and broad suppression. They do not form a simple progression from more consciousness to less consciousness, nor does any one condition independently establish the identity proposition. Their evidential value lies in whether distinct methods of altering the biological organization produce a coherent and discriminating pattern of phenomenal change.

Recursive Amplification

Anxiety and rumination provide clear examples of recursive amplification. As described in Section 2.7, a present cue may activate retained biological history, altering present valuation and supplying the basis for anticipated threat [12, 13, 21, 56, 57]. That projection changes the current condition of the organism, which in turn influences what is noticed, remembered, and evaluated next. The initial event is thereby extended through repeated internally generated stimulation.

A brief social remark, for example, may be registered and initially resolved within seconds. If interpreted as rejection, however, it may recruit related memories, anticipated consequences, bodily preparation, and concern about identity, status, or future relationships. The person may then monitor their own response and interpret its physiological consequences as further evidence that something is wrong. Although the external stimulus has ended, the organism continues to undergo new state-transitions generated by the recursive process [12, 13, 21, 22].

The expected Friction Signature is therefore not merely an increase in total metabolic expenditure. It is a temporally extended and repeatedly renewed biological profile involving memory recruitment, self-referential attribution, altered autonomic regulation, narrowed attention, threat-biased interpretation, and sustained regulatory demand.

The corresponding phenomenal state is similarly organized. Anxiety is not exhausted by an isolated unpleasant sensation. It may include bodily preparation, uncertainty, anticipated consequence, narrowed salience, temporal extension, and the recurring implication that something may happen to “me.” Recursive amplification therefore predicts increased persistence and self-related significance rather than a simple increase in consciousness considered as a unitary quantity.

Rumination exhibits the same general architecture. A past event may be repeatedly reconstructed, judged, compared with imagined alternatives, and related to its implications for the conditioned self. Each reconstruction occurs as a present biological

event and may produce additional affective, autonomic, and attentional consequences [12, 13, 21]. The system does not simply retrieve a fixed memory; it repeatedly generates new organism-relative state-transitions whose inside views may include regret, resentment, shame, anger, or helplessness.

These conditions provide an important test because the sustaining stimulation is generated largely within the organism. If the biological and phenomenal trajectory persists after the external trigger has disappeared, the measurable continuation should be traceable to the recursive organization maintaining it. Amplification should therefore be expressed not only in subjective report but also in the duration, recurrence, regulatory burden, and organism-level consequences of the event.

Selective Attenuation

Meditative and related ego-attenuation conditions provide a contrasting perturbation. In such states, autobiographical evaluation, internal commentary, future projection, and narrator-level ownership may decrease while sensory, bodily, or affective phenomenology remains available. Immediate perception may in some cases be reported as clearer or more vivid rather than globally diminished [36, 37, 43, 59].

This pattern is theoretically important because it separates primary phenomenology from the recursive processes through which events are interpreted, evaluated, and claimed as "mine." If the conditioned narrator were the necessary recipient or generator of all phenomenology, attenuation of narrator-level organization should produce a corresponding global attenuation of experience. The preservation of sensory or bodily phenomenology during reduced self-referential processing instead supports a layered architecture in which primary organism-relative processing may continue while the secondary recursive organization becomes less dominant.

The expected biological change is therefore selective rather than global. Activity associated with autobiographical evaluation, sustained internal commentary, future-oriented projection, or self-security monitoring may decrease while processes supporting sensory differentiation, interoception, attention, and immediate organism-relative integration remain active. The corresponding phenomenal change may include reduced ownership, reduced temporal extension, diminished evaluative resistance, or lower psychological friction without a complete loss of experiential content.

This prediction must remain appropriately constrained. Meditation is not a uniform biological state, and different practices recruit different combinations of attention, affect regulation, interoception, imagery, and cognitive control [59]. The framework should therefore not predict one universal signature across all meditative conditions.

The narrower prediction is that states characterized by reduced recursive self-referential processing should exhibit a corresponding attenuation of narrative ownership and self-security evaluation while preserving the primary biological organization that remains active. Such a finding would not independently establish the identity proposition, but it would weigh against the claim that the conditioned narrator is the necessary origin or recipient of every phenomenal event.

Related ego-attenuation conditions may provide a more pronounced version of the same dissociation. The ordinary boundary, centrality, or continuity of "me" may weaken while colour, sound, bodily sensation, emotion, and perceptual intensity remain present or even become unusually vivid [45]. The relevant empirical question is not simply whether the self disappears, but which components of self-related organization are attenuated and which dimensions of phenomenology remain.

Selective attenuation therefore helps distinguish the biological occurrence of phenomenology from its later organization as an experience owned by a stable autobiographical subject. It also constrains any theory that equates self-reference, reportability, or narrative continuity with phenomenal presence itself.

Distortion and Fragmentation

Dissociation, depersonalization, disturbances of agency, and selected schizophrenia-spectrum conditions alter the architecture in a different manner [46–49, 58, 61]. Rather than producing a uniform increase or decrease, these conditions may change how bodily state, perception, salience, self-location, ownership, memory, and action are integrated.

A person may remain phenomenally aware while experiencing their body, thoughts, actions, or surroundings as unfamiliar, unreal, externally controlled, or detached from the ordinary reference "me" [46, 48, 49]. Such conditions indicate that phenomenal presence and self-related organization can vary at least partially independently.

In depersonalization, for example, perception and cognition may remain broadly available while the felt immediacy, ownership, or emotional significance of experience is altered [46, 47]. The person may continue to see, think, and act while describing these events as distant, flattened, unreal, or insufficiently connected to the ordinary self. The event has not simply disappeared; its organism-relative and narrator-relative organization has changed.

Dissociative conditions may similarly involve partial decoupling among memory, bodily registration, affective response, and autobiographical attribution. An event may be biologically registered without later incorporation into a continuous personal history, or perceptual and bodily processing may continue while ownership and self-location are disrupted [46–48, 58].

Disturbances of agency provide a related constraint. A movement or thought may occur and remain phenomenally available while its authorship is weakened, misattributed, or absent [48, 49]. Event generation, phenomenal awareness, ownership, and authorship must therefore not be treated as one indivisible operation.

Selected schizophrenia-spectrum self-disturbances may involve altered salience, unstable differentiation between internally and externally generated content, disrupted agency, or impaired integration of thought into a coherent narrative reference [48, 49, 61]. These conditions are heterogeneous and should not be reduced to a single defective "self network." Their relevance lies in

demonstrating that the ordinary unity of experience depends upon multiple coordinated operations that can be selectively reorganized.

The associated Friction Signatures may consequently be mixed rather than uniformly increased or decreased. Some systems may become hyperactive, others weakly coordinated, and still others coupled in atypical ways. Phenomenal alteration may correspond more closely to changes in biological organization and relational structure than to total energetic magnitude.

This distinction provides a demanding test of the identity proposition. If the mapped event is defined by biological organization rather than energy expenditure alone, disruption of coordination should alter phenomenal structure even when substantial electrical and metabolic activity remains. Distortion conditions therefore test qualitative correspondence: they ask whether changes in ownership, agency, salience, self-location, embodiment, or perceptual organization align with changes in the biological relations proposed to support those dimensions.

Broad Suppression

General anesthesia, selected states of deep non-REM sleep, and severe disorders of consciousness provide the broadest perturbations considered here. These conditions differ substantially in cause, reversibility, residual processing, and behavioural presentation and should not be treated as biologically equivalent. Their shared relevance is that sufficiently extensive disruption of the organization required for consciousness-capable integration is associated with an absence or severe reduction of reportable phenomenology [38–40, 50–54].

General anesthesia provides a particularly useful reversible perturbation. The organism remains biologically active: metabolism continues, local signals may occur, and some sensory or nociceptive registration may persist. Nevertheless, the wider organization required for integration, temporal persistence, differentiated availability, and later report may be profoundly disrupted [38–40, 50]. This reinforces the distinction between local detection and the complete mapped event.

Sensory or nociceptive activity may therefore occur in restricted pathways without becoming integrated into the wider biological organization required for reportable pain or experience [60]. The relevant question is not whether any biological signal remains, but whether the bounded organism-relative transition retains the coordination, differentiation, temporal persistence, and organism-level availability proposed as components of the mapped organization.

Anesthesia also permits the architecture to be examined across induction, maintenance, and emergence. As consciousness-capable organization is progressively disrupted, behavioural responsiveness and report are lost. During emergence, measures of neural complexity, responsiveness, or effective connectivity may begin to recover before orientation, stable ownership, command following, and verbal report are fully restored [40, 50, 55].

This possible sequence matters because the restoration of primary consciousness-capable organization and the restoration of complete narrator-level access need not occur simultaneously. The earliest biological return cannot be inferred solely from the first spoken report or successful command following [30, 31, 40, 55]. Behavioural responsiveness is a later endpoint requiring sufficient sensory processing, integration, memory, intention, motor output, and reportability.

The framework therefore proposes a recovery hierarchy. The first stage is the restoration of biological organization capable of supporting primary organism-relative phenomenology. Later stages include increasingly stable access, retention, ownership, orientation, executive control, and report. This hierarchy must be evaluated through convergent physiological, perturbational, behavioural, and first-person measures rather than inferred from retrospective report alone.

Deep non-REM sleep provides a natural but less controlled perturbation. Some periods are associated with diminished responsiveness, reduced large-scale integration, and little or no later report, whereas other periods include dreams or fragmentary phenomenology [51, 52]. Sleep cannot therefore be treated as a uniform nightly demonstration of phenomenal absence. Its empirical value lies in comparing stages and local biological states in which complexity, integration, responsiveness, memory formation, and reportability differ.

The identity proposition predicts that phenomenal availability should track the relevant biological organization more closely than it tracks the broad behavioural category “asleep.” The presence or absence of later report must be interpreted alongside the possibility that an event occurred but was not retained.

Disorders of consciousness present a still more difficult test because motor incapacity, impaired report, fluctuating arousal, and genuine suppression of phenomenology can be difficult to distinguish. An unresponsive patient may retain more internal organization than behaviour reveals, while wake-like appearance does not by itself establish that the integration necessary for phenomenology is present [31, 53, 54].

These cases demonstrate why behaviour cannot independently define the mapped event. The framework must instead evaluate convergent indicators of effective connectivity, perturbational response, temporal complexity, metabolic organization, and organism-level integration [53, 54]. Where such measures indicate preserved consciousness-capable organization despite absent movement, the theory should not classify the organism as phenomenally absent solely because overt report is unavailable [31, 54].

Broad suppression therefore establishes a boundary condition only when the relevant biological organization—not merely behaviour, movement, or verbal response—has been shown to be sufficiently disrupted.

Graded Covariation Rather Than a Single Scale

Taken together, amplification, attenuation, distortion, and suppression do not form a single continuum extending from less consciousness to more consciousness. They perturb different dimensions of the architecture.

Anxiety may increase recursive persistence while narrowing perceptual range. Meditation may reduce narrative ownership while preserving or increasing perceptual clarity. Dissociation may preserve phenomenal presence while altering self-location, agency, or ownership. General anesthesia may broadly disrupt the organization required for reportable phenomenology.

The appropriate empirical expectation is therefore graded and multidimensional covariation. Changes in metabolic demand must be considered alongside changes in temporal persistence, differentiation, integration, autonomic regulation, ownership, memory, behavioural availability, and reportability. No single variable is expected to capture the complete relation.

This establishes a more demanding test than simple correlation. The identity proposition predicts that altering the complete organization of a bounded organism-relative event should change the corresponding phenomenal state in a structured rather than arbitrary manner. Perturbations directed primarily at narrator-level attribution should affect ownership and autobiographical organization more strongly than primary phenomenal presence. Perturbations of sensory differentiation should alter phenomenal content even when narrator-level processing remains available. Sufficiently broad disruption of integration, temporal complexity, and effective connectivity should diminish the organization required for reportable phenomenology, while restoration of that organization should permit primary phenomenology and later report to return according to the proposed recovery hierarchy.

These are preliminary relational constraints rather than complete quantitative predictions. Their force lies in consilience across distinct conditions, interventions, and measurement methods. The general proposition is that phenomenology varies with the organization of the living process, while ownership, behavioural response, memory, and report can be selectively dissociated from it.

The evidence must therefore be interpreted asymmetrically. The absence of report does not independently establish the absence of phenomenology [30, 31, 39, 54]. The presence of report does not by itself identify the biological mechanism of phenomenology. Metabolic activity does not establish the relevant organization, and behavioural complexity does not establish the presence of a narrative self. The strongest evidence arises when biological organization, perturbational response, first-person phenomenology, memory, and behavioural consequence can be measured together and experimentally distinguished.

Section 2 does not claim that these graded conditions complete the identity argument. They establish the empirical logic through which the proposition must be tested. If the proposed organization is amplified, attenuated, distorted, suppressed, and restored, the framework expects corresponding but distinguishable changes in the organism-relative event. Repeated failure of that structured relationship would count against the proposal.

Section 2.9 therefore turns from perturbational logic to empirical limits. It distinguishes the identity proposition from correlation alone and identifies the preliminary conditions under which the proposed architecture can be constrained, revised, or falsified.

2.9 Empirical Limits and Preliminary Falsification Conditions

The organism-relative identity proposition makes a stronger claim than ordinary biological dependence. It does not state merely that phenomenology requires a functioning organism or that reported conscious states correlate with measurable physical activity. Nearly every serious physical account accepts some form of biological dependence. The present proposal is more specific: phenomenology is identified as the organism-relative inside view of the relevant organized biological event. The externally measurable state-transition and the phenomenal event are therefore proposed to be one occurrence rather than two separate occurrences connected by an unexplained production relation.

A claim of this strength cannot be supported by correlation alone. Metabolic demand may rise during a reported experience without constituting the complete event. Neural activity may precede a report without identifying the biological organization responsible for phenomenology. Autonomic changes may accompany anxiety while reflecting preparation, regulation, or behavioural consequence rather than the full organism-relative transition.

Even reliable covariation remains compatible with several explanations. A measured process might produce phenomenology as a separate effect, provide conditions under which phenomenology becomes possible, support the retention or report of an event without constituting its primary occurrence, or follow the phenomenal event as a regulatory consequence. Both the measured process and the reported state might also depend upon a wider biological organization that has not yet been identified [30, 62].

The empirical task is therefore not to collect isolated correlations and rename them identity. It is to determine whether a specifically defined biological organization exhibits the temporal, structural, perturbational, and explanatory relations expected if phenomenology is its organism-relative aspect.

Three preliminary tests organize this inquiry: the Temporal Alignment Test, the Organizational Covariation Test, and the Explanatory Remainder Test. These tests do not complete the biological or formal mapping developed later in the manuscript. They establish preliminary conditions that any successful mapping must satisfy.

The Temporal Alignment Test

If phenomenology is the organism-relative inside view of a bounded biological state-transition, the phenomenal event cannot begin before the relevant organization exists, remain unchanged after that organization has been abolished, or recover independently of its restoration. The Temporal Alignment Test therefore asks whether the onset, development, attenuation, suppression, and recovery of the proposed biological event align with corresponding changes in phenomenal availability.

This question cannot be answered simply by comparing the presentation of a stimulus with a later verbal report. Report is a downstream biological achievement that may require memory formation, attentional access, recursive attribution, decision, language, motor coordination, and successful expression. The time at which a report is produced does not establish the exact time at which primary phenomenology began [30, 62, 64].

The absence of report is equally ambiguous. A person who produces no report may have undergone no phenomenology, but they may instead have undergone an event that was not retained, was not made available to the narrator, or could not be expressed because of impaired motor or linguistic output. Behavioral silence alone cannot distinguish among these possibilities [30, 31, 54].

A meaningful temporal test must therefore use convergent measures capable of separating the formation of the proposed organism-relative event from its later availability to memory, recursive ownership, behavioural response, and verbal report. These stages may overlap, but they should not be treated as interchangeable endpoints.

The expected temporal organization will differ across conditions. A brief perceptual event may arise and resolve rapidly. A recursively sustained anxiety state may continue through repeated internally generated stimulation after the initiating external cue has disappeared. During anesthesia, some local sensory or nociceptive activity may persist while the wider organization required for consciousness-capable integration, retention, and report is disrupted [38–40, 50, 60].

Temporal alignment does not require every measurable component to begin and end at precisely the same instant. Registration, persistence, integration, valuation, regulation, recursive attribution, and behavioural expression may occupy different phases of the transition. The stronger requirement is that the complete organization proposed to constitute the phenomenal event should occupy the same relevant temporal trajectory as the organism-relative state.

The framework would be weakened if robust phenomenology were repeatedly demonstrated under conditions in which the complete proposed organization was conclusively absent. It would likewise be weakened if that organization remained intact while phenomenology systematically failed to occur, provided that the apparent absence could be established independently of failures of attention, memory, ownership, motor output, or report.

This qualification prevents behaviour from being treated as a direct measurement of phenomenology. The Temporal Alignment Test concerns the relation between the biological event and its inside view, not merely the relation between biological activity and what the narrator can later say about it. The externally described organization and the organism-relative phenomenal state should therefore exhibit the same relevant temporal trajectory at the level of organization the theory identifies. A late report is not itself the primary event, and an absent report is not by itself evidence that no event occurred.

The Organizational Covariation Test

Temporal alignment is necessary but insufficient. Two processes may occur during the same interval without being identical or directly related. The identity proposition therefore also requires structured correspondence between changes in biological organization and changes in phenomenal organization.

The Organizational Covariation Test asks whether altering a defined dimension of the biological state-transition changes the corresponding phenomenal dimension in the manner predicted by the architecture. The relevant requirement is structured covariation, not undifferentiated increase or decrease.

The framework does not predict that every increase in metabolic demand will produce greater phenomenal intensity, that every decrease in one neural network will diminish consciousness, or that all phenomenal states can be ranked along one scale from less to more. Different perturbations may affect different components of the event.

A perturbation of sensory differentiation should alter phenomenal character more directly than autobiographical ownership. A perturbation of narrator-level attribution may alter the sense that an event belongs to “me” without eliminating primary phenomenal presence. A disturbance of bodily integration or self-location may alter embodiment while leaving language, memory, and perception substantially available. A sufficiently broad disruption of integration, temporal complexity, and organism-level availability may reduce several dimensions together.

The empirical analysis must therefore distinguish phenomenal presence, phenomenal character, intensity or salience, integration among contents, bodily and spatial organization, narrative ownership, memory availability, behavioural responsiveness, and reportability. These dimensions ordinarily occur together, but the graded perturbations examined in Section 2.8 suggest that they can be selectively altered.

Anxiety, for example, may increase recursive persistence, self-related salience, and autonomic recruitment while narrowing perceptual breadth [12, 13, 56, 57]. Meditative attenuation may reduce autobiographical commentary and self-security evaluation while preserving immediate sensory or bodily phenomenology [36, 37, 43, 59]. Dissociation may preserve phenomenal presence while altering ownership, agency, bodily connection, or autobiographical integration [46–49, 58]. Broad suppression may disrupt several dimensions simultaneously [38–40, 50–55, 60].

Such patterns cannot be interpreted adequately through a single measure such as total energy consumption, average neural activity, behavioural complexity, or verbal report. The identity proposition concerns the organization of the complete event and the relations among its components.

Controlled perturbation therefore provides stronger evidence than passive observation alone [63]. If a particular biological organization is proposed to support narrative ownership, selectively altering that organization should affect ownership across more than one task, stimulus, or diagnostic condition while leaving primary phenomenal presence comparatively less affected. If

another organization is proposed to support sensory differentiation, altering it should produce corresponding changes in phenomenal character even when narrator-level processing remains available. If broad effective integration is proposed to be necessary for reportable phenomenology, its disruption and restoration should produce reproducible changes that cannot be explained solely by motor incapacity or memory failure.

The evidential force lies in convergent prediction across conditions. A circular analysis would identify a biological pattern from reports of a state, label that pattern as its mechanism, and then use the same reports to confirm the label. Stronger evidence requires the proposed organization to predict what should occur under new perturbations, in different tasks, or across distinct conditions that alter the same architectural component.

The framework would be weakened if controlled alteration of a proposed organization produced no reliable change in the phenomenal dimension assigned to it. It would also be weakened if the same fully specified biological organization were repeatedly found under otherwise controlled conditions in which incompatible phenomenal states were reliably established, with no additional biological difference capable of accounting for the divergence.

Apparent contradictions must nevertheless be interpreted cautiously. Two states may appear biologically identical because the available measurements are too coarse. Similar average activity may conceal different temporal sequences, cellular populations, connectivity relations, chemical conditions, regulatory states, or organism-relative histories [62, 64]. The identity proposition concerns the complete organized event rather than whichever limited variables are easiest to measure.

That qualification creates a serious methodological danger. The framework could become unfalsifiable if every failed prediction were dismissed by claiming that some unknown biological difference must exist beneath the available measurements. The theory must therefore progressively specify which biological dimensions are considered relevant, how they are expected to vary, and what degree of unexplained divergence would require revision.

Failure of one candidate marker would not automatically falsify the entire identity proposition. It might show that the marker was insufficiently specific, that it tracked arousal or report rather than phenomenology, or that the proposed biological description was incomplete. Repeated failure of the complete predicted organizational profile would be more serious. The empirical burden is cumulative: the framework must progressively narrow the permissible mapping rather than protect itself through indefinite appeals to unmeasured complexity.

The Explanatory Remainder Test

The third test concerns whether a sufficiently complete account of the bounded biological event leaves an additional independently operating process that must still be introduced. The Explanatory Remainder Test asks whether, after the relevant biological organization, temporal trajectory, organism-relative valuation, thermodynamic implementation, and causal consequences have been specified, another process remains necessary to account for the phenomenal event.

This test should not be reduced to the question of whether phenomenology possesses a separate energy supply. Many properties of organized systems do not require independent energetic budgets, and the absence of a distinct phenomenal energy source does not establish identity. The stronger question is whether an additional recipient, observer, translator, or phenomenal mechanism must be inserted after the biological event has been described.

The proposed biological account must therefore include more than stimulus input, neural firing, or local activity. It must account for the registration of consequential change, the persistence of that change within the organism, its integration with the organism's existing condition, its biological valuation, the differentiation and temporal continuity of the developing state, its effects upon regulation and action, and its later availability for memory, ownership, and report.

If these operations remain unspecified, an explanatory remainder will naturally persist. An incomplete description of neural firing does not become a complete account merely because it is described as physical. A measure of total metabolism does not identify phenomenology merely because the event consumes energy, and a behavioural output does not reveal the inside view merely because it demonstrates biological responsiveness.

The Explanatory Remainder Test therefore places a substantial burden upon the framework itself. It must identify biological properties corresponding to distinctions often assigned only to phenomenology, including unity and differentiation, organism-relative significance, qualitative variation, temporal development, bodily orientation, salience, and causal influence upon subsequent processing.

The test does not require an external scientist to acquire the organism's inside view by measuring the event. Exterior and organism-relative descriptions arise under different conditions of access. A measurement does not become pain, colour, anxiety, or warmth within the scientist performing it, but that difference in access does not by itself establish a second occurrence.

An explanatory remainder would instead consist of an additional process possessing independent timing, organization, causal function, or existence that must be added after the complete biological transition has been specified. If such a process were empirically required, the identity proposition would need revision. If every established phenomenal distinction corresponded to an identifiable distinction within the complete biological organization, and no additional recipient or translation process were required, the identity proposition would be strengthened.

The Explanatory Remainder Test cannot independently prove identity. Its role is to prevent the explanatory gap from being preserved merely by assuming that a second phenomenal event must appear after the biological work has already been completed.

Identity, Production, Enablement, and Report

The three preliminary tests help distinguish the organism-relative identity proposition from several neighbouring models. Under a production model, a biological event causes phenomenology as a distinct result. Under an enabling model, the biological event provides conditions under which another process gives rise to phenomenology. Under a reporting model, the measured event makes an already occurring phenomenal state available to memory, ownership, behaviour, or speech. Under the identity proposition, the complete relevant biological event and phenomenology are one occurrence described under exterior and organism-relative conditions of access.

These accounts may make similar predictions in simple correlation studies because each may predict that altering the nervous system changes reported experience. They diverge when the architecture is specified more completely. An enabling account must identify what further process occurs once the enabling conditions are present. A production account must explain the transition from biological cause to phenomenal product. A reporting account permits phenomenology to remain present when report mechanisms are selectively disabled.

The identity proposition predicts no additional production step between the complete organism-relative event and its inside view. This does not make the proposal true by definition. The theory must still identify the relevant event with sufficient precision and demonstrate that changes in its organization align with changes in phenomenology more successfully than rival explanations.

Limits of First-Person and Third-Person Evidence

The empirical program must operate across an unavoidable asymmetry of evidence. First-person report provides evidence concerning phenomenal distinctions but is shaped by attention, memory, language, expectation, recursive ownership, and reconstruction [30, 62, 64]. Third-person measurement provides access to biological organization but does not present the investigator with the organism's inside view. Neither source is complete.

First-person evidence can distinguish pain from colour, fear from calm, ownership from detachment, and perceptual clarity from confusion. Yet the report occurs after substantial biological processing and may simplify, distort, or omit features of the primary event. Third-person evidence can identify timing, metabolism, connectivity, autonomic regulation, perturbational response, and causal influence, but current measurements may fail to capture the spatial, temporal, cellular, or organism-level organization relevant to phenomenal differentiation [63, 64].

The framework therefore requires triangulation among controlled perturbation, careful first-person characterization where available, behavioural measurement, physiological and metabolic measurement, temporal analysis, and prediction across different conditions. No single source should define the event circularly.

First-person report should not be dismissed merely because it is subjective; it provides evidence about the phenomenal distinctions the theory seeks to explain. Third-person measurement should not be treated as complete merely because it is objective; a coarse measure may omit the organization that matters. The task is to determine whether independently obtained descriptions converge upon the same bounded state-transition.

Levels of Falsification

A distinction must be maintained between falsifying a particular proposed mechanism and falsifying the general organism-relative identity proposition. Failure of one metabolic marker to track a phenomenal condition would count against that marker as a sufficiently specific Friction Signature, but it would not establish that no organized biological identity exists. If one neural network proved unnecessary for a particular phenomenal state, that finding would falsify an account assigning exclusive responsibility to that network rather than the wider identity proposition. An incorrect estimate of energetic cost, recovery interval, threshold, or recursive overhead would require revision of the corresponding quantitative model without necessarily overturning the broader architecture.

The general identity proposition would face a more serious challenge if the relevant biological event had been specified with sufficient completeness; its proposed organization had been preserved, altered, or abolished through controlled intervention; phenomenal presence or character had been assessed independently of simple behavioural output; and the predicted structured relation repeatedly failed.

Findings that would weigh strongly against the framework include robust phenomenology persisting after complete abolition of the proposed organism-relative organization; systematic phenomenal absence despite preservation of that organization and intact mechanisms of access, memory, and report; reproducible changes in phenomenal character without corresponding changes in any biologically relevant dimension of the event; or successful prediction of phenomenal organization by a rival mechanism that excludes the proposed mapped unit.

The framework should also be revised if Friction Signatures consistently track only arousal, attention, motor preparation, behavioural responsiveness, or report while failing to distinguish phenomenal states that differ along the dimensions the theory claims to explain. The theory must not define every possible result as confirmation. Amplification without the predicted persistence, attenuation without the predicted separation of ownership from phenomenal presence, distortion without measurable organizational disruption, or suppression without loss of the proposed consciousness-capable organization would each require the associated claim to be reconsidered.

Preliminary Status of the Empirical Program

Section 2 has identified the proposed explanatory target; the distinction between inside view and inner observer; the bounded state-transition as the mapped unit; the necessity of organized thermodynamic implementation; the role of Friction Signatures; and the empirical value of graded perturbation.

These elements establish a coherent research architecture.

They do not yet establish the complete mapping between every phenomenal distinction and every biological variable. That work requires comparative analysis, more precise biological derivation, formal mapping conditions, and empirical evaluation across multiple states and organisms.

The framework therefore makes two commitments simultaneously. It maintains the strong identity proposal: phenomenology is the organism-relative inside view of the relevant biological event. It also accepts the empirical burden created by that proposal: the event must be specified precisely enough that amplification, attenuation, distortion, suppression, and recovery produce testable and potentially disconfirming results.

> *Put plainly, the identity cannot be protected by remaining vague. The framework must identify what process is proposed, how it is measured, which phenomenal dimensions it supports, and what finding would demonstrate that the mapping is wrong.*

These preliminary conditions define the empirical burden of the identity proposition. The final subsection clarifies the scope of that proposition, the evolutionary implication that follows from it, and the path by which the later sections develop and constrain the biological architecture.

2.10 Scope, Evolutionary Implication, and Forward Development

The organism-relative identity proposition is intentionally general, but it is not unlimited. It does not attribute phenomenology to every physical process, every form of energy dissipation, every exchange of information, or every instance of biological activity. Nor does it imply that all organisms possess equivalent phenomenal capacities or that a minimally organized biological event should be understood as a reduced version of human consciousness.

The proposal is narrower. Phenomenology is identified with the organism-relative inside view of a bounded biological state-transition in which consequential change is registered, retained long enough to influence the developing event, integrated with the current condition of the living system, biologically valued, and resolved through an organized alteration of that system. Resolution, in this context, denotes a transition into a consequentially altered biological state. It does not necessarily imply that the initiating condition has been eliminated or that psychological, behavioural, or regulatory closure has been achieved.

Each component of this formulation constrains the proposed identity. The process must be enacted within and organized relative to a living system's actively maintained condition; merely occurring within biological material or inside an organism is insufficient. The event must involve more than isolated detection, passive physical change, or an externally assigned function. It must possess sufficient temporal and organizational coherence to form a bounded transition, and the developing event must alter the organism in a manner that participates in subsequent regulation, perception, or action.

These constraints distinguish the framework from views that attribute phenomenology to matter, energy, information, or complexity in general. The theory is therefore not a form of unrestricted panpsychism. A stone changes position, a crystal develops an ordered structure, a flame consumes fuel, and a thermostat responds to temperature. Each system exhibits physical change, and some exhibit feedback or sensitivity to environmental conditions. None thereby satisfies the complete organism-relative organization proposed as the mapped unit.

The relevant distinction is not based upon a vital substance or an unexplained metaphysical boundary between living and non-living matter. It arises from the organization characteristic of living systems. An organism continuously maintains a bounded condition against thermodynamic decay, preserves and restores gradients, regulates internal variables, and changes its future activity according to prior disturbances [24, 32]. The consequences of an event are therefore physically expressed through the way that event alters the organism's maintained state and subsequent regulation.

Organism-relative significance is not assigned from outside by a human observer. A chemical concentration, temperature change, mechanical disturbance, or internal signal may participate in beneficial, damaging, or inconsequential biological outcomes depending upon the organism, its current condition, the location and duration of the change, and the regulatory pathways involved. The same physical stimulus may therefore participate in different state-transitions in different organisms, or even in the same organism under different conditions [23, 24].

This organism-relative dependence is central to the identity proposition. The framework does not begin with abstract information and then ask why information should acquire a phenomenal property. Information may describe relations within the event, but information alone is not the mapped target. The target is the organized biological transition through which consequential change becomes part of the current condition and subsequent activity of the living system.

The same restriction applies to computational descriptions. A formal model may reproduce selected input-output relations, thresholds, feedback loops, or patterns of information transfer without reproducing the thermodynamic, regulatory, historical, and organism-relative conditions through which the biological event is enacted. Functional resemblance may therefore be scientifically informative without establishing phenomenal identity.

The present framework does not establish a general impossibility theorem concerning artificial phenomenology. It does establish that computational or functional resemblance alone is insufficient. A simulation of registration, integration, valuation, or response does not thereby instantiate the organism-relative biological event defined by the theory. Unless a non-biological system could instantiate the self-maintaining, thermodynamically grounded, and organism-relative conditions specified by the mapping, it would remain outside the present theorem's domain. Phenomenal status cannot be inherited through computational analogy alone.

The framework is consequently substrate-sensitive without being restricted to one anatomical substrate. Human neural tissue is not assumed to be the only possible biological implementation of an organism-relative inside view. Different organisms may enact registration, persistence, integration, valuation, and resolution through different cellular structures, signalling mechanisms, temporal scales, and regulatory pathways. The relevant question is not whether two organisms possess the same anatomy, but whether the complete bounded organization identified by the theory is physically realized in each case.

Substrate sensitivity must not be confused with unrestricted substrate independence. The architecture cannot be detached from the material conditions that make organism-relative valuation possible and treated as a purely formal pattern. The biological medium, maintained gradients, regulatory history, and relation of the event to the continued condition of the organism are not incidental details added to an abstract computation. They are part of the process being mapped.

The scope of the identity proposition must also be distinguished from the scope of the conditioned narrator. Section 1 described how the human sense of a continuing owner is generated through memory, comparison, language, anticipation, and recursive self-reference. That organization profoundly modifies human phenomenology. It links present events to autobiographical history, evaluates them in relation to an apparent "me," projects their implications into possible futures, and makes them available for reflection and report.

The narrator is therefore biologically consequential, but it is not the proposed source of all phenomenology. The organism-relative identity proposition concerns the primary biological event before that event is retrospectively named, claimed, or incorporated into an autobiographical narrative. Recursive processing can reorganize, amplify, and prolong the event, but it does not have to create its first organism-relative occurrence.

This distinction prevents the theory from defining phenomenology according to capacities that are unusually developed in humans. Language, abstract reasoning, autobiographical memory, explicit self-recognition, and verbal report may transform the complexity and temporal depth of human experience [1, 2, 5–8, 30]. Their absence does not, by itself, establish the absence of every organism-relative inside view.

The reverse inference must also be avoided. Separating primary phenomenology from the narrator does not justify attributing human-like experience to organisms that lack human forms of memory, self-reference, social evaluation, and future projection. A biological system without those capacities would not undergo the same organized phenomenal world as a human organism. The identity proposition permits continuity without equivalence.

Evolutionary Implication

The distinction between primary phenomenology and recursive narration carries a significant evolutionary implication. If phenomenology depended upon a human-like narrator, its origin would have to be located wherever language, autobiographical ownership, explicit self-modeling, or comparable recursion first appeared. The architecture developed in Sections 1 and 2 suggests a different possibility.

If the narrator is a secondary biological construction, while phenomenology is the organism-relative inside view of a primary bounded state-transition, then the evolutionary history of phenomenology need not begin with reflective self-consciousness. More elementary forms of the relevant organization may precede language, autobiographical identity, and highly centralized nervous systems.

This is an implication of the identity proposition, not an independent demonstration of it. The theory does not claim that phenomenology appeared with the beginning of life, nor does it claim that every living system necessarily possesses the organization required for an inside view. It holds that the relevant boundary should be investigated in terms of biological organization rather than assigned in advance to a familiar human structure or capacity.

The evolutionary question therefore becomes: at what point does biological regulation acquire the bounded organism-relative organization required by the proposed mapping? That question cannot be answered simply by selecting an anatomical structure and declaring it to be the universal threshold.

A cerebral cortex is necessary for many forms of human perception, abstraction, report, and recursive selfhood [64, 68, 69]. It does not follow that cortical anatomy establishes the lower boundary of every possible form of organism-relative phenomenology. A nervous system may greatly increase the speed, differentiation, integration, memory, and behavioural flexibility of biological processing without necessarily marking the first possible occurrence of the more general organization identified by the framework.

The theory therefore resists an unexplained anatomical cutoff. If phenomenology is the organism-relative aspect of a general class of biological state-transitions, its distribution should be investigated by tracing the relevant organization itself. This does not require that the distribution be continuous, universal, or reducible to one scale. Evolution may produce thresholds, divergent implementations, convergent solutions, losses of capacity, and abrupt increases in complexity.

The proposed architecture may be absent in many living systems, minimally instantiated in others, and extensively elaborated in organisms with centralized nervous systems and recursive memory. The word graded must therefore be used carefully. It does not imply that all organisms can be arranged along a single line representing an amount of consciousness.

Organisms may differ in the range of changes they can register, the duration for which those changes persist, the number and type of signals they can integrate, the forms of biological valuation available to them, the flexibility of their responses, the extent of organism-level coordination, and the degree to which earlier state-transitions can be re-entered or recursively sustained. These differences may alter phenomenal character, temporal depth, differentiation, integration, salience, and ownership in different ways.

An organism might possess a narrow but highly reliable sensitivity to one class of consequential change, while another integrates numerous external and internal variables over extended temporal intervals. Human organisms additionally reconstruct events through language, social evaluation, autobiographical identity, and imagined futures. These are not simply larger and smaller quantities of one undifferentiated property. They are differently organized forms of the organism-relative event.

Evolutionary continuity therefore does not imply phenomenal sameness. Organisms may share selected relational features while differing radically in substrate, history, regulatory demand, available distinctions, and recursive depth. The existence of a common structural principle would not allow the complete qualitative character of another organism's inside view to be inferred from human experience.

The comparative claim is consequently structural before it is qualitative. Where registration, persistence, integration, valuation, and resolution appear to be present in the relevant bounded form, the framework identifies a candidate mapped biological event for further investigation. The presence of these preliminary features does not by itself establish phenomenology. The complete mapping conditions and their empirical constraints must still be satisfied.

This approach avoids two opposing errors. The first is anthropocentric exclusion: the assumption that an organism lacking human language, anatomy, behaviour, or self-report must therefore lack all phenomenology. The second is anthropomorphic inflation: the attribution of human-like intention, emotion, selfhood, or deliberation wherever a biological system displays sensitivity or adaptive response.

The organism-relative identity proposition supports neither conclusion. It requires evidence of the relevant biological organization while restricting interpretation to the capacities that the measured system can support. A plant that integrates signals and produces a thresholded response should not automatically be described as deciding, intending, suffering, or possessing a narrative self [41, 65, 66]. Its organization should not, however, be dismissed solely because it lacks neurons, speech, locomotion, or human-like behaviour.

Comparative analysis must therefore preserve three distinctions: a potentially shared organizational principle, the substrate-specific mechanism through which that principle is implemented, and the organism-specific complexity of the resulting state-transition. The first makes comparison possible, the second prevents different organisms from being reduced to one mechanism, and the third prevents elementary organization from being mistaken for human consciousness.

The identity proposition also changes the form of the evolutionary explanation required. The framework does not propose that evolution first produced a complete system of biological regulation and then attached phenomenology to it as an additional property. Natural selection acts upon organismal variation expressed through survival, reproduction, regulation, learning, and behaviour [67]. If the identity proposition is correct, selection acts upon the biological organization and its organism-level consequences, while phenomenology is the organism-relative inside view of that same evolving event.

Under that identity, no separate evolutionary pathway would be required to add experience to an otherwise completed biological process. The exterior causal organization is what selection encounters, and the organism-relative inside view would not constitute a second independently selected trait. The biological event changes through the evolution of sensitivity, integration, valuation, coordination, retention, and response; its inside view changes because the event itself has changed.

This reasoning does not prove the identity proposition. It shows that the proposal is compatible with evolutionary continuity without requiring an independent mechanism through which a non-phenomenal biological process produces a second phenomenal property.

The major evolutionary transition associated with the human narrator would therefore not be the creation of phenomenology from previously non-phenomenal biology. It would be the emergence of a powerful recursive organization capable of re-entering prior events, projecting possible futures, representing a continuing owner, and using that representation to modify subsequent organism-relative processing.

Such an architecture profoundly expands the phenomenal world. It introduces autobiographical continuity, symbolic meaning, social identity, extended psychological time, imagined consequence, and recursively sustained suffering. It does so, however, by reorganizing and amplifying primary biological phenomenology rather than by supplying an inside view to an otherwise experientially empty process.

The evolutionary implication can therefore be stated cautiously. If the identity proposition is correct, primary phenomenology should track the emergence and elaboration of bounded organism-relative biological state-transitions—including registration, persistence, integration, valuation, and resolution—rather than appearing only with the human narrative self.

That implication motivates comparative investigation, but it does not determine the result in advance. The relevant architecture may prove more restricted than the framework currently anticipates. Some systems that appear to integrate signals may lack one

or more necessary conditions, while others may implement the relevant organization in ways that the present model has not yet captured. The comparative program must therefore be capable of narrowing, revising, or rejecting the proposed boundary.

The Flytrap as a Comparative Boundary Case

The Venus flytrap provides a useful initial boundary case because it permits the proposed organization to be examined in a comparatively simple living system. It is not introduced as proof of plant consciousness, nor is it selected because its visible movement superficially resembles animal behaviour.

Its scientific value lies in the possibility of identifying a measurable sequence in which consequential change is registered across time, multiple signals contribute to a threshold, the organism enters a coordinated state-transition, and the event is followed by regulatory, metabolic, electrical, and mechanical consequences [41, 65, 66]. These features make it possible to ask whether the biological architecture introduced in Section 2 can be investigated without presupposing a human nervous system or conditioned narrator.

The flytrap therefore functions as a test of the framework's biological generality. If its analysis requires the covert introduction of human capacities such as intention, conscious deliberation, symbolic representation, or reflective self-awareness, then the comparison fails. If the relevant sequence can be described entirely in terms of measurable biological operations, it may help distinguish the organizational features that are genuinely general from those that emerge only in more complex organisms.

The comparison must remain asymmetrical. Human phenomenology cannot be projected wholesale onto the plant, and the plant's threshold dynamics cannot serve as a miniature model of every human conscious process. The purpose is to determine whether both systems instantiate selected relational features while differing radically in substrate, temporal scale, differentiation, recursive depth, and behavioural capacity.

The flytrap is particularly useful because it places pressure upon the proposed lower boundary. A theory that identifies phenomenology with verbal report, cortical broadcast, or autobiographical selfhood excludes the case by definition. A theory that identifies phenomenology with metabolism, responsiveness, or information processing alone includes it too easily. The organism-relative identity proposition must occupy a more demanding position between those extremes.

The comparative analysis must therefore determine what consequential change is registered, how that change persists across time, which signals are integrated, what determines the threshold for commitment, how the organism's prior condition alters the response, what biological work is required to enact and resolve the transition, and what Friction Signature profile characterizes the event. It must also identify which features of human recursive phenomenology are absent.

These questions do not assume that the flytrap possesses phenomenology. They translate the identity proposition into comparative biological terms and establish the evidential burden that the case must meet.

Forward Development

The remainder of the manuscript develops this architecture in stages. The next section clarifies the relation between primary organism-relative phenomenology and the secondary recursive processes through which human events are interpreted, attributed, remembered, and reported. That distinction is necessary before comparative biology is introduced, because the absence of a human-like narrator must not be confused with the absence of every possible inside view, and the presence of primary phenomenology must not be interpreted as evidence of a hidden human-like self.

The subsequent comparative sections examine the Venus flytrap as a possible minimal boundary case. Their purpose is to identify a biologically measurable sequence involving registration, temporal persistence, threshold integration, organism-relative consequence, coordinated state alteration, and recovery, and to determine whether that sequence forms a bounded state-transition of the kind introduced in Section 2.4.

Later sections develop the thermodynamic and recurrent dimensions of the architecture. The Stochastic Pump provides a model of how living systems maintain, renew, and resolve organized activity under continual energetic constraint. Its role is not to transform energy into phenomenology. It describes the physical work through which the proposed organism-relative state-transition is enacted and sustained.

The empirical program then examines Friction Signatures across conditions of amplification, attenuation, distortion, suppression, and recovery. These comparisons are intended to determine whether the proposed biological organization tracks phenomenal distinctions more precisely than metabolism, behaviour, electrical activity, or report considered in isolation.

Formal development must follow biological specification rather than substitute for it. Mathematical relations can clarify variables, constrain possible mappings, and generate testable predictions, but they cannot rescue an undefined explanatory target. The biological event must first be identified with sufficient precision that its boundaries, necessary components, perturbational behaviour, and measurable consequences can be stated.

Only then can the relation between external biological description and organism-relative inside view be formalized without concealing the explanatory problem inside mathematical notation.

The forward program therefore proceeds by identifying the conditioned narrator as a secondary recursive construction; identifying the bounded organism-relative state-transition as the primary explanatory target; distinguishing organized thermodynamic implementation from energy magnitude alone; specifying measurable Friction Signatures; testing the architecture through graded perturbation; examining whether its organization scales across biological substrates; and progressively constraining the proposed identity through comparative, mechanistic, and formal analysis.

Section 2 has introduced the proposition that guides this program: phenomenology is not an additional product delivered to an inner observer. It is the organism-relative inside view of the relevant organized biological event.

The strength of that proposition will depend upon whether the event can be identified without circularity, measured without reducing phenomenology to one marker, compared across organisms without anthropomorphism, and perturbed in ways that produce the structured covariation outlined in the preceding sections. Its scope is therefore broad enough to motivate comparative biological inquiry but narrow enough to incur substantial empirical risk.

The framework does not place phenomenology everywhere, nor does it reserve phenomenology for the human narrator. It places the explanatory burden upon a constrained class of living state-transitions and requires the remainder of the manuscript to establish why that class—rather than biological activity, computation, integration, or energy expenditure in general—should be identified as the relevant organism-relative event.

3.0 The Two-Level Architecture of Phenomenology and Narration

3.1 Primary Phenomenology Before Narrative Ownership

Primary phenomenology does not require that an event first be recognized, named, or represented as belonging to a continuing self. Under the organism-relative identity proposition, the relevant biological state-transition is already phenomenal from the organism-relative side before it is recursively organized as "my experience."

This claim does not imply that primary phenomenology is biologically simple. A perceptual, interoceptive, affective, or painful event may involve extensive registration, persistence, integration, valuation, and organism-level coordination. The term primary identifies its architectural relation to narrative ownership, not a lack of biological complexity.

A noxious stimulus, for example, may alter sensory processing, autonomic regulation, attention, protective readiness, and the organism's subsequent state before the event is explicitly identified as pain arising from a particular source. The organism may undergo the painful transition before it recalls a prior injury, evaluates the seriousness of the condition, or forms the thought, "This is happening to me." [3, 4, 27, 28]

The later attribution does not supply the original phenomenal occurrence. It organizes an event already underway in relation to retained history, anticipated consequence, language, and the conditioned self-reference.

The same distinction applies to perception. A visual event need not wait for explicit categorization before possessing phenomenal character. Colour, contrast, movement, shape, and spatial relation may already be present within the organism-relative perceptual transition before the narrator identifies an object, retrieves its name, evaluates its significance, or incorporates it into an autobiographical account [29, 30, 64].

Recognition may follow rapidly and ordinarily becomes so closely coupled to perception that the two appear simultaneous. Their close temporal and functional coupling should nevertheless not be confused with identity. The capacity to identify, compare, own, and report an event requires additional biological operations beyond those required for the primary event to occur [30, 62, 64, 72].

Narrative ownership is one such operation. It represents the developing event in relation to an apparent continuing subject: this is happening to me; this is my body; this is my fear; this is what I see. These relations may profoundly alter the event, but they are not necessary for its first organism-relative occurrence.

The distinction is especially clear in states where phenomenal content remains available while explicit ownership is weakened or absent. A sensation may occur without being experienced as fully "mine." A movement or thought may remain phenomenally present while its authorship is uncertain or misattributed. Immediate sensory awareness may continue while autobiographical self-reference is markedly attenuated [36, 37, 43, 45–49, 72].

Such cases do not establish that primary and narrative processing are independent systems. They indicate that phenomenal presence and explicit ownership are distinguishable dimensions of biological organization.

Primary phenomenology must also be distinguished from introspective access. Introspection requires the organism to direct further processing toward its own state, categorize aspects of that state, and often retain them for comparison or report. An event need not become the object of this higher-order activity in order to occur phenomenally [30, 62, 64].

The organism can therefore undergo pain without simultaneously thinking about pain, perceive colour without representing itself as a perceiver, and experience bodily disequilibrium without constructing an explicit account of what the state means.

This does not imply a hidden subject beneath the narrator. The primary event is not possessed by a more primitive internal witness. It is organism-relative because it occurs through the altered organization of the living system itself.

The absence of narrative ownership therefore removes the need to posit an additional owner rather than removing the biological relation through which the event is phenomenal. The living organism is not a container in which experience is presented to someone else. It is the organized system undergoing the state-transition.

The distinction also clarifies the meaning of temporal priority. Primary phenomenology need not occupy a long interval before recursive processing begins. In human organisms, recognition, ownership, memory retrieval, and report preparation may follow extremely rapidly and may overlap with the continuing development of the event.

The claim is architectural rather than dependent upon a large measurable delay. Narrative attribution requires an event available to be attributed, even when the biological processes supporting attribution begin almost immediately and subsequently feed back into the developing state.

Primary does not therefore mean completed before the narrator becomes active. It means that the phenomenal event is not generated by the narrator's act of recognizing or owning it.

Once narrator-level processing begins, the distinction becomes dynamically recurrent. The primary event supplies content to recursive organization, while the consequences of that organization alter the biological conditions from which later phenomenal processing develops. The event initially occurring without explicit ownership may therefore be rapidly transformed by memory, expectation, interpretation, resistance, or self-reference.

This feedback does not erase the distinction between the levels. It demonstrates why ordinary human experience rarely presents them separately. By the time an event is remembered or reported, primary phenomenology and recursive interpretation may have influenced one another repeatedly.

The two-level architecture therefore rejects two opposing errors. The first is to treat the narrator as the necessary subject to whom phenomenology must be delivered. The second is to treat primary phenomenology as an isolated, passive residue unaffected by higher-order processing.

Primary phenomenology is the organism-relative inside view of the relevant biological state-transition before explicit narrative ownership. It is biologically organized, causally consequential, and capable of being modified by the recursive processes that follow.

Section 3.2 examines those recursive processes more directly and clarifies how the narrator, although secondary to primary phenomenology, produces substantial biological and phenomenal consequences.

3.2 The Recursive Narrator and Its Biological Consequences

The recursive narrator is a secondary biological organization through which the organism interprets, compares, attributes, and projects events already occurring within it. It does not stand outside the organism as an independent thinker or owner. It is generated through the coordinated operation of memory, language, evaluation, anticipation, and repeated self-reference.

Its secondary status does not make it unreal or biologically unimportant. Once active, narrator-level processing can substantially alter the condition of the organism and the phenomenal events that follow.

A primary perceptual, affective, interoceptive, or painful event may become available to retained history. The organism may compare it with prior events, assign it a name, evaluate its implications, anticipate possible consequences, and represent it as belonging to a continuing "me." These operations extend the event beyond its immediate biological conditions and organize it within psychological time.

The narrator therefore does more than describe what has already occurred. Its interpretations become new biological events.

A present sensation may activate a memory. The memory may alter the meaning assigned to the sensation. That meaning may generate anticipation, bodily preparation, autonomic change, and redirected attention. These consequences then modify the biological state from which the next perceptual or affective event develops.

The process is recurrent:

primary organism-relative event
→ recognition, comparison, and attribution
→ memory retrieval and future projection
→ altered biological condition
→ modified subsequent organism-relative event

This sequence is not a rigid pipeline. Its components may overlap, recur, and influence one another rapidly. Its purpose is to show that the narrator enters an event already underway and then becomes part of the causal organization shaping what follows.

Memory is central to this process. Retained biological history allows current conditions to be evaluated in relation to earlier injury, reward, social consequence, success, failure, or threat. The remembered event is not retrieved as a physiologically inert record. Its reactivation changes the organism in the present [9, 10, 12, 13, 15, 21, 22].

Language adds another level of organization. Naming an event can stabilize a category, direct attention toward selected features, connect the present state with broader conceptual relations, and make it available for communication and later recall. A word

such as pain, rejection, danger, failure, or loss does not merely label a completed state. It can reorganize how the event is interpreted and how the organism prepares to respond [70, 71].

Comparison further extends the process. The current event may be measured against what previously occurred, what was expected, what another person appears to possess, or what the narrator believes should be happening. Through comparison, a biological event can acquire implications that were not contained in the initiating stimulus alone.

Anticipation carries these implications into possible futures. The organism can respond not only to what is occurring but also to what may occur, what must be prevented, or what might be lost. A projected future is virtual in representational content, but its activation is a present biological event with present physiological consequences [9–13, 16].

Self-reference organizes these processes around the apparent continuity of "me." [5–7, 69, 72] The current state is interpreted in relation to a remembered past and projected future belonging to the same presumed owner. The narrator thereby constructs continuity across events that are biologically distributed and continually changing.

This continuity is not produced by a separate subject observing the sequence. It is generated through the repeated attribution of changing biological states to a common virtual reference.

The narrator may therefore represent:

this happened to me;
this is what I am;
this threatens my future;
this confirms what others think of me;
or this must not happen again.

Such relations can alter salience, attention, autonomic regulation, memory accessibility, behavioural preparation, and the phenomenal character of later events [12, 13, 21, 22, 69–71].

Narrator-level ownership is therefore biologically active. Representing a painful sensation as "my pain," a social event as "my rejection," or an uncertain outcome as "my possible failure" can recruit additional processing beyond the primary event. The attribution may intensify monitoring, prolong memory activation, increase defensive readiness, or generate resistance to the state already occurring.

The narrator can also take its own activity as new input. A person may become anxious about being anxious, ashamed of feeling shame, or frightened by the possibility of losing control. The recursive process then no longer depends solely upon the initiating disturbance. Its own interpretations, projections, and physiological consequences can become sufficient to renew the cycle [12, 13, 21, 22].

This architecture helps explain the persistence of psychological states after their external trigger has disappeared. A brief event may be repeatedly reconstructed through memory, comparison, anticipated consequence, and self-referential valuation. Each reconstruction is a new biological occurrence capable of altering the organism again.

The narrator is therefore not a passive commentary track. It can generate internally produced stimulation with measurable metabolic, autonomic, attentional, and regulatory effects [12, 13, 16, 21, 22].

Its biological consequences may be adaptive. Recursive organization supports planning, communication, social learning, delayed action, error correction, and the integration of prior experience into future behaviour [9, 10, 68, 71]. The ability to represent possible outcomes and relate them to retained history greatly expands the flexibility of the human organism.

The same capacities can also sustain friction. When recursive processing repeatedly returns to unresolved threat, contradiction, comparison, avoidance, or protection of the conditioned self-representation, the organism may remain under prolonged biological demand.

The distinction between adaptive and frictional recursion does not depend simply upon whether thought is pleasant or unpleasant. It concerns whether recursive processing contributes to effective resolution or continually regenerates the conditions of its own continuation.

Planning may terminate in action. Reflection may lead to learning or behavioural revision. Naming an event may improve regulation and communication. In such cases, recursive processing changes the organism and contributes to a subsequent resolution.

By contrast, rumination may repeatedly reactivate the same retained history without producing effective change. Anticipatory anxiety may sustain preparation for an event that remains uncertain or absent [12, 13, 21]. Self-protective comparison may continually reproduce the threat it is attempting to resolve.

The biological cost of such recursion is not reducible to total energy use. It lies in the repeated recruitment and prolonged organization of memory, attention, autonomic regulation, valuation, prediction, and self-related monitoring.

The corresponding phenomenal state is likewise not a simple quantity added to the original event. Recursive processing changes its character. A primary bodily sensation may become fear of illness. A social disappointment may become shame, resentment, or anticipated rejection. A brief pain may become anxiety about future pain or concern about permanent injury.

The narrator therefore contributes further phenomenology without being the origin of phenomenology as such.

This distinction is central to the two-level architecture. Primary organism-relative phenomenology supplies the event upon which recursive processing operates. The recursive narrator then reorganizes that event through retained history, language, comparison, ownership, and projected consequence. Its effects alter the organism and thereby contribute to later organism-relative phenomenology.

The levels are causally continuous but architecturally distinguishable.

The narrator should also not be mistaken for a single neural location or unified executive mechanism. It is a distributed functional organization assembled through interacting biological processes [5–10, 48, 49, 68, 69, 72]. Different components of narration—memory retrieval, language, agency, ownership, valuation, temporal projection, and report—may depend upon partially distinguishable systems and may be selectively altered.

The apparent unity of the narrator arises because these processes are repeatedly organized around the same self-reference. Their coordinated operation produces the impression of a stable thinker who remembers the past, experiences the present, and anticipates the future.

Under the present framework, however, the thinker is not an entity standing behind those operations. The apparent thinker is the organized result of the operations themselves.

This formulation avoids two opposite errors. The first is to treat the narrator as an independently existing cause and recipient of experience. The second is to assume that, because the narrator is illusory as a separate entity, the biological processes that generate and sustain it are causally insignificant.

The narrator remains an illusion in the specific sense that no independent thinker, owner, or observer exists apart from the recursive biological organization producing that appearance. The illusion is generated through conscious thought operating in psychological time, the temporal organization intrinsic to memory-dependent conscious thought itself. Psychological time is therefore the medium in which such thought operates; it does not require explicit thought about the chronological past or future. Retained history is recruited within present conscious processing through recognition, comparison, interpretation, evaluation, imagery, and repeated reference to a virtual self-reference, and this organization can also extend into projected possible futures.

The self-reference is virtual, but the process that constructs and renews it is physically instantiated. Thought, memory, anticipation, attribution, and self-protective evaluation can alter autonomic regulation, attention, metabolic demand, behaviour, and subsequent phenomenal organization [12, 13, 16, 21, 22]. The illusion does not become an independently existing self merely because it has consequences.

The narrator is therefore illusory as an entity but biologically consequential as an organized process. Its apparent continuity and agency are generated by recursive activity, while that activity can re-enter the organism and modify the conditions from which later phenomenology develops.

Section 3.3 examines this feedback more directly. It considers how recursive processing re-enters primary organism-relative organization and why phenomenal presence, ownership, memory, behavioural response, and report must remain analytically distinct.

3.3 Feedback, Dissociation, and Report

The distinction between primary organism-relative phenomenology and secondary recursive narration is architectural rather than absolute. The two levels are not isolated systems operating independently of one another. Once narrator-level processing begins, its consequences alter the biological condition of the organism and thereby influence subsequent phenomenology.

A primary event may therefore become the input to recursive processing, while the resulting memory retrieval, interpretation, ownership, anticipation, or resistance becomes new biological stimulation. That stimulation changes attention, autonomic regulation, salience, bodily state, and the accessibility of related memories. The organism then encounters the next phase of the event from an altered condition.

The relation can be summarized as follows:

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primary organism-relative event
→ recursive interpretation and attribution
→ altered biological condition
→ modified subsequent organism-relative event
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This sequence is recurrent rather than strictly linear. The later phase does not travel backward and create the initial phenomenal occurrence, but it can rapidly reorganize what follows. In ordinary human experience, primary phenomenology and recursive interpretation may therefore become tightly coupled and difficult to distinguish introspectively.

A painful sensation illustrates this process. The initial event may involve nociceptive registration, organism-relative valuation, protective regulation, and phenomenal pain. Once the event is recognized and interpreted, however, the organism may retrieve memories of earlier injury, anticipate continued damage, monitor the affected body part, or become concerned about future incapacity. These recursive consequences can intensify attention, increase autonomic demand, alter muscular regulation, and change the character of the continuing pain [27, 28].

The later state may therefore include more than the initial painful event. It may also include fear, resistance, anticipated loss, self-protective monitoring, and the attribution of the condition to a continuing "me." The developing phenomenology is modified by the narrator without having been created by it.

The same principle applies to perception. An initially ambiguous visual event may acquire a different phenomenal organization after recognition. Once a form is identified as a threat, a familiar face, or an object of personal significance, attention, bodily preparation, memory, and salience may change [56, 57, 71]. The physical input may remain substantially unchanged while recursive interpretation alters the organism-relative event that follows.

Feedback therefore helps explain why perception is not merely passive reception. The organism's retained history, current concerns, expectations, and self-related evaluations can influence how later stages of an event are organized. This does not require a separate observer selecting among interpretations. The modulation is performed by the same biological system whose activity generates the apparent observer.

The architecture also permits dissociation among partially distinguishable dimensions. Phenomenal presence, ownership, agency, memory, behavioural response, and report depend upon partially distinguishable biological operations and therefore need not always vary together [30, 45–49, 58, 62, 64, 72].

Phenomenal presence concerns whether the relevant organism-relative biological event occurs.
Ownership concerns whether that event is recursively represented as belonging to "me."
Agency concerns whether an action or thought is attributed to the apparent self as its own production.
Memory concerns whether the event is retained and later available for reconstruction.
Behavioural response concerns whether the organism can act upon or express the event.
Report concerns whether aspects of the event can be translated into gesture, language, or another communicable form.

These dimensions are often closely coupled in ordinary waking life. Their usual co-occurrence can create the impression that they constitute one indivisible phenomenon. Perturbation and pathology indicate, however, that they can be selectively altered.

An event may remain phenomenally present while ownership is weakened. Bodily sensation, perception, or thought may continue while being experienced as unfamiliar, detached, or insufficiently connected to the ordinary self. Such cases do not show that the event lacks biological organization. They indicate that the recursive relation through which it is claimed as "mine" has been altered.

Agency may also dissociate from phenomenal presence. A movement or thought may occur and remain available while its authorship is uncertain, weakened, or attributed elsewhere. The occurrence of the event, awareness of it, ownership of it, and judgment of authorship must therefore not be treated as one biological operation.

Memory provides another possible dissociation. A phenomenal event may occur without later being retained in a form accessible to recall. The absence of subsequent memory does not by itself establish that no event occurred [30, 74, 75]. It may instead indicate disruption of the biological processes required for encoding, consolidation, retrieval, or narrator-level reconstruction.

The same caution applies to behavioural response. Motor output may be inhibited, disconnected, impaired, or unavailable even when substantial internal organization remains intact [31, 73, 75]. Conversely, a complex behavioural response does not by itself identify the complete phenomenal organization underlying it.

Report is therefore a particularly demanding biological endpoint. Verbal report may require sensory registration, organism-relative integration, attentional availability, memory retention, recursive attribution, language, decision, motor planning, and successful expression. Failure at one of these stages may prevent report without establishing that the primary organism-relative event failed to occur [30, 62, 64].

This does not make report scientifically unimportant. First-person report provides important evidence concerning phenomenal distinctions such as pain, colour, fear, clarity, ownership, detachment, and bodily location. The error lies not in using report, but in treating report as identical to the event being reported.

Report is a later biological achievement through which aspects of the event become communicable. It is evidence concerning phenomenology, not the definition of phenomenology itself.

The relation between report and narrator-level ownership must also be handled carefully. A person may report an event using first-person language even when the ordinary sense of ownership is weakened. Conversely, an event may be strongly organized around "me" yet remain difficult to describe accurately. Language, ownership, memory, and phenomenology overlap, but they are not interchangeable.

Dissociation therefore provides an empirical advantage. By selectively altering one component while preserving others, it becomes possible to investigate which biological operations contribute to phenomenal presence, ownership, agency, memory, behaviour, and report.

Meditative attenuation offers one possible example. Recursive self-referential processing may decrease while sensory or bodily phenomenology remains available [36, 37, 43, 59]. The important point is not that all forms of meditation produce a uniform condition, but that reduced narrator-level activity need not produce a global absence of phenomenology.

Depersonalization provides a different pattern. Perception and cognition may continue while felt ownership, emotional immediacy, or connection to the ordinary self is altered [46, 47, 72]. Here the relevant event is not globally suppressed; its self-related organization is distorted.

Locked-in conditions provide another important distinction. Primary phenomenology, ownership, memory, and intention may remain substantially intact while motor expression is severely restricted [73]. The absence of ordinary behavioural response must therefore not be equated with suppression of the organism-relative event itself.

General anesthesia and profound coma present a different class of perturbation. In these conditions, the central question is not merely whether report or movement is unavailable, but whether the biological organization required for the phenomenal event remains present. Local activity may persist even when large-scale integration, temporal organization, effective interaction, retention, and organism-level availability have been broadly disrupted [38–40, 50, 53–55, 60, 64].

These conditions should not be collapsed into one category. Their value lies in the different architectural relations they perturb. Locked-in states primarily disrupt expression. Amnestic states may disrupt retention or later access. Disturbances of ownership alter recursive attribution. Deep anesthesia and profound coma become relevant when the biological organization proposed to constitute the phenomenal event is itself globally suppressed.

The evidence must therefore be interpreted according to the biological level that has been perturbed. The absence of report alone does not establish the absence of phenomenology, because report can fail through disruption of memory, language, motor output, or narrator-level access while primary organism-relative organization remains intact [30, 31, 64, 73–75]. This limitation applies only where the biological conditions proposed to support primary phenomenology may still be present.

It does not follow that phenomenology should be presumed to persist after those conditions have been comprehensively suppressed. Where convergent evidence indicates the loss of the integration, temporal organization, effective connectivity, organism-level availability, and regulatory coordination required by the mapped event, the framework predicts the corresponding absence of phenomenology. It does not preserve an additional non-reportable phenomenal residue after the complete organism-relative biological event has been abolished.

The empirical distinction is therefore between failure of expression and failure of the event itself. Locked-in states and related motor disconnections may preserve phenomenology while preventing ordinary report. Deep anesthesia, profound coma, and comparable conditions become relevant when the biological organization required for the event is suppressed rather than merely disconnected from behaviour.

A stronger empirical approach must therefore combine first-person report where available with physiological, perturbational, temporal, and behavioural evidence capable of distinguishing preserved internal organization from its broad suppression [31, 53, 54, 64, 73, 75]. The aim is not to infer phenomenology from report alone, but to determine whether the biological event proposed to be phenomenology remains present.

The two-level architecture therefore makes several preliminary relational predictions. Perturbations directed primarily at recursive attribution should alter ownership, autobiographical organization, and self-related evaluation more strongly than primary phenomenal presence. Perturbations directed at memory or report mechanisms should impair later access or expression without necessarily abolishing the initial event. Broad suppression of the integration, temporal organization, and organism-level coordination required by the mapped event should suppress phenomenology itself.

These are not yet complete quantitative predictions. Their importance lies in preventing the framework from identifying phenomenology with whichever downstream capacity is easiest to observe while also refusing to protect phenomenology as an empirically inaccessible residue after its proposed biological basis has been abolished.

Feedback and dissociation also clarify the status of the narrator. The self remains illusory as an independently existing thinker, owner, or observer. No separate entity stands outside the recursive process and directs it. The biological organization that constructs and sustains the self-reference is nevertheless real and causally effective.

Thought operating through psychological time can retrieve retained history, project possible futures, and organize present processing around a virtual "me." That virtual reference can alter attention, regulation, behaviour, and later phenomenal organization. Its consequences do not transform the illusion into an independently existing self. They demonstrate that an illusory entity can be generated and sustained by a real biological process whose effects are measurable.

> **The distinction can therefore be stated precisely: the narrator is illusory as an independent entity but biologically consequential as an organized recursive process.**

This formulation preserves the separation between primary phenomenology and narrative ownership without treating them as disconnected. Primary organism-relative events can occur before explicit ownership and report. Recursive processing can then re-enter the organism, alter what follows, and contribute further phenomenology. Because the relevant operations are partially separable, phenomenal presence, ownership, agency, memory, behaviour, and report can dissociate under different conditions.

Section 3.4 defines the limits of this distinction and prepares the transition to comparative biology. The absence of a human-like narrator cannot by itself establish the absence of primary phenomenology, but neither can biological responsiveness alone justify the attribution of human-like experience.

3.4 Limits of the Distinction and Transition to Comparative Biology

The distinction between primary organism-relative phenomenology and secondary recursive narration is necessary, but it must not be mistaken for a division between two independent biological systems.

L1 and L2 do not denote separate substances, isolated organs, or wholly autonomous processing streams. They identify distinguishable levels of organization within one living system. Primary organism-relative events can occur without explicit narrative ownership, while recursive processes can later interpret, attribute, prolong, and transform those events. In ordinary human functioning, however, the two levels interact continuously.

The distinction is therefore architectural rather than anatomical. Some biological processes may contribute predominantly to primary registration, integration, valuation, and resolution, while others may contribute more strongly to autobiographical memory, language, self-reference, psychological time, and report. Their contributions can overlap, and the same neural or physiological system may participate differently depending upon the developing event.

Nor should the distinction be interpreted as a rigid temporal sequence in which L1 is completed before L2 begins. A primary state-transition may still be developing when recognition, comparison, memory retrieval, or ownership begins. Recursive processing can then alter later phases of the same event and contribute new phenomenal organization.

The central claim is more limited and more precise: explicit narrative ownership is not required for the first organism-relative phenomenal occurrence to occur. The narrator enters a biological event already underway, even when that entry follows rapidly and becomes difficult to distinguish from the event through introspection alone.

Primary also does not mean primitive in the sense of being disorganized, reflexive, or biologically trivial. A primary event may involve extensive coordination across sensory, interoceptive, affective, regulatory, and action-related systems. What makes it primary is its relation to recursive ownership, not the number or sophistication of the processes involved.

Likewise, secondary does not mean causally weak. Narrator-level processing can become one of the dominant influences upon the organism's subsequent state. Memory, anticipation, comparison, language, and self-reference can amplify or attenuate attention, autonomic activity, behavioural preparation, and continuing phenomenology. The secondary level is derivative in origin but capable of substantial biological consequence.

The framework must also avoid treating L1 as a hidden inner witness beneath the narrator. Removing the autobiographical self does not reveal a more primitive observer who receives raw experience. Primary phenomenology remains the organism-relative inside view of the complete organized biological state-transition, not an object presented to another internal subject.

The two-level distinction therefore does not replace one homunculus with another. L1 is not a silent experiencer, and L2 is not a separate executive watching L1. Both terms refer to forms of biological organization within the organism, while the apparent owner emerges from recursive relations among them.

A further limit concerns comparative inference. The absence of human language, autobiographical memory, explicit self-reference, or report does not by itself establish the absence of primary phenomenology. Those capacities belong primarily to the recursive architecture through which an organism interprets and communicates its states. Their absence may therefore show that human-like narration is unavailable without showing that no organism-relative event occurs.

This point is especially important when considering non-human organisms. A system need not construct the thought "this is happening to me" in order for a consequential biological transition to be organized relative to its own condition. Registration, persistence, integration, valuation, and response can occur without autobiographical ownership.

The converse error must be avoided with equal care. Biological responsiveness alone does not establish phenomenology. A chemical reaction, reflexive mechanism, isolated feedback loop, or local regulatory adjustment may respond selectively to changing conditions without satisfying the organization proposed for the bounded organism-relative state-transition.

The framework therefore permits neither automatic exclusion nor automatic inclusion.

It does not exclude phenomenology merely because an organism lacks a human-like narrator.

It does not attribute phenomenology merely because a system detects a stimulus or produces a response.

The relevant question is whether the organism instantiates the organized biological relations identified by the framework: consequential registration, persistence across time, integration with current organismic condition, organism-relative valuation, coordinated state alteration, and resolution within a bounded living system.

Even the presence of these relations would not justify attributing human-like phenomenal content. Differences in sensory structure, temporal integration, memory, regulatory architecture, action capacity, and recursive depth would be expected to produce correspondingly different organism-relative states.

Comparative analysis must therefore separate two questions that are often conflated.

The first is whether a non-human organism instantiates the minimal organization proposed as the mapped biological organization of a primary organism-relative event.

The second is what phenomenal character, if any, could reasonably be associated with that organization.

Evidence relevant to the first question does not automatically answer the second. Demonstrating biological registration, temporal persistence, integration, valuation, and resolution may support comparison at the level of organization without revealing that another organism experiences pain, colour, fear, or ownership in a human form.

The task is not to project familiar human content into unfamiliar biological systems. It is to determine whether the structural relations proposed by the identity framework are present in simpler or differently organized forms.

This comparative strategy has two advantages. First, it prevents human report and self-narration from being treated as universal prerequisites for phenomenology. Second, it constrains the theory by requiring it to identify which biological relations are fundamental and which emerge only with greater nervous-system complexity and recursive depth.

A useful boundary case should therefore satisfy several conditions. Its biological organization should be sufficiently simple that the relevant transitions can be described with precision. The system should exhibit measurable registration, retention or persistence, threshold dependence, organism-state sensitivity, coordinated commitment, energetic cost, and recovery or resetting. At the same time, it should lack the human narrative architecture that ordinarily obscures the distinction between primary phenomenology and recursive ownership.

Such a case cannot prove phenomenology by analogy. Its value lies in testing whether the proposed biological architecture extends beyond the human nervous system and whether the framework can distinguish a minimal organism-relative transition from ordinary reactivity.

The Venus flytrap provides a useful comparative boundary case for this purpose. It registers mechanical disturbance, retains temporally relevant information across successive stimulation, integrates that information against a threshold, modifies its response according to organismic condition, commits to a coordinated state-transition, incurs measurable biological cost, and later resets [41, 65, 66, 76–81].

The flytrap provides no evidence of a human-like narrator, autobiographical self-reference, linguistic report, or the memory-dependent conscious thought through which psychological time operates. It therefore offers a way to examine the biological organization of registration, persistence, integration, valuation, commitment, and resolution without assuming that narrative ownership is the source of the event.

The following section does not begin by declaring that the flytrap is conscious. It asks a narrower and more scientifically tractable question: whether its bounded state-transitions instantiate a minimal form of the organism-relative organization identified in Section 2.

The answer will not be determined by resemblance to human behaviour alone. It will depend upon the biological structure of the event, the conditions under which it occurs, the energetic and regulatory work required to sustain it, and the limits of what can legitimately be inferred from those findings.

Section 4 therefore turns from the human two-level architecture to comparative biology. The aim is to identify which elements of the proposed mapped event are conserved in a system without a recursive narrator and which elements depend upon the greater differentiation, memory, and temporal depth of animal nervous systems.

4.0 Testing the Architecture in a Non-Neural Organism

4.1 Why Use a Comparative Boundary Case?

The two-level architecture developed in Section 3 separates primary organism-relative phenomenology from the recursive narrator through which human beings recognize, interpret, own, and report their states. That distinction creates a comparative question. If narrative ownership is not the source of primary phenomenology, which features of the underlying biological event are fundamental, and which depend upon the specialized organization of a human nervous system?

A useful way to approach this question is to examine a living system in which the relevant biological operations can be observed without the additional complexity of language, autobiographical memory, psychological self-reference, and extended recursive thought.

The Venus flytrap, Dionaea muscipula, provides such a comparative boundary case.

The flytrap is not introduced because its behaviour resembles human experience in any superficial sense. Nor is it presented as proof that plants possess pain, perception, selfhood, or consciousness in a human form. Its value lies in the unusual clarity with which a temporally extended and biologically consequential state-transition can be examined in a non-neural organism.

A trap does not close in response to every mechanical disturbance. Deflection of a trigger hair initiates a local receptor event and associated electrical and calcium dynamics, but a single qualifying stimulation ordinarily does not produce immediate closure. A consequence of that stimulation persists for a limited interval. A further qualifying disturbance occurring within that interval can contribute to threshold crossing and initiate a coordinated mechanical transition [41, 65, 66, 76, 77, 80].

The event therefore contains more than instantaneous detection followed by automatic output. It includes registration, temporal persistence, integration of successive disturbances, threshold-dependent commitment, energetic and regulatory consequence, and eventual restoration of the conditions required for future responsiveness.

These features make the flytrap relevant to the bounded organism-relative biological state-transition defined in Section 2.

The comparison remains organizational rather than anatomical. A trigger hair is not a neuron, a plant action potential is not a cortical representation, and trap closure is not equivalent to human behavioural report. The plant and human systems differ profoundly in substrate, complexity, differentiation, memory capacity, temporal depth, and available forms of action.

The question is therefore not whether the two systems are biologically identical. It is whether some of the relations proposed to be fundamental to an organism-relative event can be instantiated through different biological structures.

Those relations include the maintenance of a receptive state, the registration of consequential change, the temporary retention of prior stimulation, the integration of new input with the system's current condition, transition across a response threshold, coordinated alteration of organismic state, and recovery or resetting after the event.

Studying these relations in a comparatively simple system has several advantages.

First, the temporal boundaries of the event are more accessible than they are in ordinary human experience. In the human organism, sensory registration, memory retrieval, attribution, anticipation, language, bodily regulation, and report preparation may begin within closely overlapping intervals. The primary event and its recursive interpretation rapidly influence one another, making their component operations difficult to isolate.

The flytrap presents a more experimentally tractable sequence:

receptive readiness
→ mechanical disturbance
→ retained biological consequence
→ further qualifying stimulation
→ threshold-dependent commitment
→ altered mechanical and regulatory state
→ restoration and renewed availability

This sequence should not be interpreted as a complete theory of phenomenology. It provides a biological structure within which the proposed components of the mapped event can be identified and tested.

Second, the flytrap exposes the importance of persistence. The consequence of the first stimulation must remain biologically available if a later stimulation is to contribute to closure. Whatever physical variables carry that consequence, the system must resist immediate dissipation strongly enough for the earlier event to affect the later one [66, 77].

This creates a concrete maintenance problem. Electrochemical gradients must be preserved. Excitability must remain available. Signals must propagate through noisy living tissue. The system must integrate disturbance without either responding indiscriminately or losing the earlier state before further input arrives [32, 77, 78].

Third, the response is organism-relative. Closure is not an abstract computation performed independently of the condition of the plant. It is an evolved biological commitment with consequences for energy expenditure, photosynthesis, prey capture, digestion, tissue regulation, and future responsiveness [65, 79].

The significance of a trigger-hair disturbance therefore depends upon its relation to the living system in which it occurs. The same mechanical force applied under different spatial, temporal, developmental, or physiological conditions need not produce the same biological transition [65, 66, 76–81, 83].

This does not mean that the flytrap consciously judges whether a disturbance is beneficial or harmful. Biological valuation, as used in this framework, does not require reflective assessment. It refers to organism-relative differential biological treatment of a disturbance through its relation to the organism's current condition, maintained organization, regulatory requirements, and available biological responses.

Fourth, the event can be perturbed. Temperature, anesthetic exposure, electrical conditions, repeated stimulation, and physiological state can alter signal propagation, threshold integration, closure, recovery, and resetting [65, 66, 78, 80, 81, 83]. The relevant organization can therefore be investigated through controlled changes rather than inferred from behaviour alone.

This is important because a comparative boundary case should do more than supply an analogy. It should allow the proposed architecture to be constrained. If registration remains while integration fails, detection and coordinated commitment can be distinguished. If electrical excitability recovers before complete mechanical function, recovery can be separated into stages. If restoration of gradients is disrupted, the system's later availability can be examined directly [78, 80, 81].

The flytrap therefore offers access to the internal organization of the event rather than merely to its visible outcome.

Its use nevertheless requires strict limits.

The presence of registration, persistence, integration, threshold crossing, and coordinated response does not automatically establish phenomenology. Many biological and artificial systems can detect changes and produce selective outputs. The framework cannot simply attribute an inside view wherever stimulus discrimination is observed.

The relevant question is whether the flytrap instantiates the more complete organism-relative organization specified by the theory and, if so, what that establishes about the portability of the proposed mapped unit.

Likewise, the absence of neurons cannot by itself settle the phenomenal question in either direction. The comparative argument does not proceed by claiming that because some plant processes resemble neural processes, the plant must experience what an animal experiences.

The argument is narrower. If a biological relation is proposed to be fundamental, its necessity must be distinguished from the particular anatomy through which it is implemented. Where similar organizational functions occur across different living substrates, a theory must explain which differences are decisive and which are merely implementation-specific.

The flytrap is therefore positioned at a boundary.

It is complex enough to exhibit temporally extended, integrated, state-dependent, and energetically consequential biological transitions. It is also sufficiently different from the human nervous system that the comparison cannot rely upon language, report, cortical anatomy, autobiographical memory, or recursive self-reference.

That combination makes it useful for testing the scope of the organism-relative identity proposition.

The section that follows does not begin by asking what the flytrap feels. It begins with a more basic biological question: what occurs when a mechanical disturbance is registered by the trigger hair, and how does that initial event become available to the wider state-transition?

Section 4.2 therefore examines mechanical registration and the initiation of electrical and calcium-dependent signalling within the trap.

4.2 Mechanical Registration at the Trigger Hair

The bounded flytrap state-transition begins with mechanical registration. Each trap lobe contains touch-sensitive trigger hairs positioned to detect contact from potential prey. These structures do not merely transmit an external force into passive tissue. A qualifying displacement alters the electrical and chemical condition of specialized mechanosensitive cells near the base of the hair, converting a local mechanical disturbance into a biologically available signal [76, 80].

This conversion is the first stage of the event. Before the trap can retain, integrate, or act upon a disturbance, the disturbance must produce a change within the organization of the plant itself. The physical movement of the hair therefore becomes biologically consequential only when it modifies the excitable state of the trap.

Not every contact produces the complete response. The mechanical disturbance must exceed effective mechanical thresholds in variables such as trigger-hair deflection angle, angular velocity, or force. Subthreshold mechanical disturbances need not initiate the same propagating electrical event [76]. The trigger hair therefore performs an initial filtering function: it constrains which external disturbances enter the wider state-transition.

The term registration is used here in this limited biological sense. It does not imply reflective recognition, symbolic representation, or a plant observer that notices the contact. It means that an external change has produced a differentiated and consequential alteration within the living system.

In an open, mature trap, sufficient trigger-hair deflection can first produce a local receptor potential and calcium elevation in mechanosensitive cells near the trigger-hair podium. When this local excitation reaches the relevant threshold, it can initiate a rapidly propagating action potential together with a long-range calcium signal that spreads across the trap lobe [76, 77, 80]. The disturbance is thereby transformed from a local mechanical event into a distributed electrical and chemical change capable of influencing the subsequent condition of the capture organ.

The action potential depends upon coordinated ion movement across cell membranes. Calcium-permeable channels, anion channels, potassium channels, proton pumps, and other transport processes contribute to the initiation, propagation, repolarization, and restoration of the electrical event [77, 78]. The precise contribution of each component varies across the phases of the signal, but the general organization is clear: mechanical deformation changes membrane conductance, ion movement alters electrical potential, and the resulting excitation propagates beyond the point of contact.

The accompanying calcium signal is closely coupled to this electrical event. Calcium entering the cytoplasm participates in a broader calcium transient that may be further amplified through release from intracellular stores, as proposed in current mechanistic models [77]. The electrical action potential and calcium wave are therefore related aspects of the developing biological response, although they should not be treated as interchangeable measurements of one variable.

The action potential provides rapid electrical propagation. The calcium dynamics contribute a chemically embodied consequence that can persist beyond the brief electrical spike and participate in later integration [66, 77]. Their coordinated operation allows the initiating disturbance to affect the state of the trap after the trigger hair has returned toward its resting position.

Mechanical registration is therefore not exhausted by the visible movement of the hair or by the presence of one electrical spike. It consists of the organized conversion through which a transient external disturbance becomes a distributed alteration of the living system.

This distinction separates the flytrap from a purely passive mechanical device. A bent spring may retain elastic energy, and a switch may change position when pressed, but the flytrap response depends upon actively maintained cellular conditions. Membrane potentials, electrochemical gradients, channel availability, intracellular calcium regulation, and tissue excitability must already be organized before the contact occurs [32, 77, 78]. The external force does not supply the complete organization of the response. It perturbs a living system whose maintained state determines what the disturbance can become.

This becomes particularly clear when traps at different developmental stages are compared. Immature, unopened traps can exhibit local electrical and calcium responses to trigger-hair stimulation, but they do not yet show the same fast long-distance electrical

and calcium signalling characteristic of mature, opened traps. During development, the complement and organization of ion transporters change, and the capture organ acquires a fast, tightly interconnected signalling network [77, 80].

The same general type of mechanical disturbance can therefore have different biological consequences depending upon the existing condition of the plant. The stimulus alone does not determine the event. Registration depends upon the relation between the disturbance and the organized state of the organism receiving it. This developmental difference is important for the organism-relative framework. Mechanical force can be described externally without reference to the plant, but whether that force becomes a trap-wide electrical event depends upon the biological architecture present at that moment. An unopened juvenile trap, an excitable mature trap, and a physiologically disrupted trap do not instantiate the same state-transition merely because their trigger hairs are displaced in a similar way. The event is therefore organism-relative from its beginning. Its character is constrained by the current excitability, maintained gradients, developmental stage, prior stimulation, and regulatory condition of the living system.

This does not mean that registration already contains every later element of the bounded transition. Detection must be distinguished from persistence, integration, commitment, and closure. A trigger hair may register a qualifying disturbance and initiate electrical and calcium activity without the trap immediately completing its mechanical response.

That distinction is experimentally valuable. It permits the initiating stage to be separated from the conditions required for threshold crossing. Under some perturbations, local sensitivity may remain while propagation, integration, or closure is impaired. The visible absence of trap movement therefore need not mean that no mechanical registration occurred [80, 81].

Conversely, the presence of an action potential should not be treated as sufficient evidence for the complete organism-relative event. It is an initiating component whose consequence becomes significant through its relation to subsequent signalling, retained state, additional input, threshold dynamics, and organism-level response. The action potential is therefore neither a miniature decision nor a plant equivalent of a human thought. It is a propagating biological change that makes the registered disturbance available to the wider organization of the trap.

The same caution applies to calcium signalling. Calcium waves occur widely across living systems and participate in numerous forms of regulation [82]. Their presence alone does not establish phenomenology, valuation, or integrated organism-level commitment. What matters here is the role the calcium signal plays within a larger bounded sequence. In the flytrap, the initiating calcium and electrical events are connected to a temporally extended hunting response. Their effects can remain relevant long enough for a later disturbance to interact with the altered state left by the first. When the required conditions are satisfied, the combined history can contribute to threshold crossing and rapid closure [65, 66, 77].

Mechanical registration therefore identifies the entry point of the comparative event, not its completion. This first stage establishes several important constraints. The event begins through a selective relation between an external disturbance and a prepared living system. It depends upon maintained nonequilibrium conditions rather than upon mechanical force alone. It produces an internal change that can propagate beyond the point of contact. Its occurrence varies with developmental and physiological state. And its biological consequence can outlast the initiating movement.

None of these findings establishes that the flytrap experiences the contact. They establish that the plant does not merely undergo an undifferentiated physical impact. The disturbance is selectively converted into an organized electrical and chemical alteration that becomes available to later stages of the capture response [76, 77, 80].

The relevant scientific question now moves from registration to persistence. If the first disturbance is to influence the response to a later disturbance, some consequence of the initial event must remain biologically effective after the immediate mechanical contact has ended.

Section 4.3 examines how that retained consequence participates in temporal integration and threshold-dependent closure.

4.3 Temporal Persistence and Threshold Integration

Mechanical registration alone does not explain trap closure. A single qualifying trigger-hair deflection can initiate an action potential and calcium signal without immediately producing the complete mechanical response. For a later disturbance to contribute to closure, some consequence of the first event must remain biologically effective after the initiating contact has ended. The flytrap therefore provides a clear example of temporal persistence within a non-neural biological system [65, 66, 77].

The electrical action potential is comparatively brief. Membrane depolarization is followed by repolarization and restoration toward the resting potential. The associated cytoplasmic calcium transient develops over a longer interval and decays more gradually. Experimental measurements show that this calcium consequence persists over tens of seconds, with the effective two-event integration window ordinarily on the order of about 30 seconds under the conditions examined [66, 77].

The first stimulation therefore leaves the trap in a condition that is not identical to its pre-stimulus state. Although the trigger hair may have returned toward its resting position and the rapid electrical spike may already be resolving, the biological consequences of the disturbance remain active. This retained consequence gives the first event temporal reach. A second qualifying stimulation delivered while the earlier alteration remains effective does not act upon an unchanged system. It enters a trap whose calcium state and recent electrical condition have already been altered by the first event, with additional physiological contributors potentially also involved. The response to the second disturbance is therefore determined partly by the system's retained biological state [66, 77].

The basic relation can be represented as follows:

first qualifying disturbance
→ electrical and calcium alteration
→ partial persistence of the altered state
→ second qualifying disturbance
→ interaction with the retained consequence
→ threshold-dependent transition

This is temporal integration in its minimal biological form. The later event is processed in relation to a physical consequence of the earlier event.

The retained state should not be imagined as a symbolic record describing what previously occurred. The trap does not need to represent the proposition that one trigger-hair contact has taken place. Its history is embodied in the altered condition of the living tissue. The phrase biological memory may be used for this form of persistence, but only with careful qualification. It does not imply recollection, representation, autobiographical continuity, or conscious access. It refers to a present physical state whose organization has been shaped by a prior event and can therefore alter the effect of a later one. The memory is the modified biological condition itself.

This distinction is important because scientific accounts of the flytrap often describe it as "counting" action potentials [65, 77]. The language is useful as shorthand for the relationship between the number and timing of electrical events and the plant's later response. It should not, however, be taken to imply that the plant constructs an abstract numerical representation. The trap need not explicitly encode "one" and then "two." Successive electrical and calcium events alter a developing biological state. When those alterations occur within the relevant interval and reach sufficient combined magnitude, the system crosses a transition threshold. Threshold integration is therefore a more precise term than cognitive counting.

In many ordinary conditions, two qualifying trigger-hair stimulations occurring within the effective temporal window are sufficient to initiate rapid closure. This is not an absolute two-touch rule: under some mechanical conditions, a single trigger-hair deflection can generate more than one action potential and initiate closure [41, 65, 66, 76]. The more fundamental relation is therefore the required excitation history within the relevant interval rather than the literal number of external contacts. The event is thus dependent upon the number and timing of qualifying electrical events generated by stimulation. Two ordinary contacts widely separated in time are not biologically equivalent to two contacts occurring while the first event remains active.

This gives the trap a simple form of historical dependence:

$$\text{effect of present input} \neq \text{input alone}$$

Rather:

$$\text{present disturbance acting upon the retained biological state}$$

These expressions are conceptual rather than quantitative equations. They identify the essential biological relation: current response depends upon both current stimulation and the persisting consequences of prior stimulation.

The threshold should not be treated as an immaterial decision point added to the physiology. It is physically instantiated in the evolving state of the biological system. Electrical excitation and calcium dynamics contribute to the developing pre-closure state, while the rapid mechanical execution of closure can now be specified more precisely: in-situ hydraulic and mechanical measurements indicate that the snap is too fast to be driven by water transport and is initiated by rapid softening of the epidermal cell walls, which releases elastic energy stored in the mechanically primed trap and permits snap-through [84, 85]. Ion transport, tissue hydration, and other regulatory processes remain important to the preparation and broader physiological condition of the trap, but they should not be identified as the immediate motor of the subsecond snap. Nor should the threshold be understood as a single universal number detached from biological condition. The observed two-stimulation pattern is a characteristic operating relation under appropriate conditions, not evidence that every trap always responds identically regardless of temperature, age, health, prior stimulation, mechanical circumstances, or physiological state [76, 77, 80, 81, 83]. The threshold is organism-relative because it belongs to the current organization of a particular living system.

This relation reveals why persistence and integration must be distinguished from registration. The first trigger-hair contact may be successfully registered even when it is not followed by closure. Registration means that the disturbance has altered the plant. Closure requires that the developing biological state reach the organization necessary for mechanical commitment. The absence of closure after one stimulation therefore does not mean that nothing occurred. It means that the event remained below the transition threshold or that its retained consequence decayed before sufficient additional stimulation arrived. Likewise, the second stimulation should not be understood as an independent command that instructs the plant to close. It is effective because it interacts with a system already altered by the first event. The mechanical response emerges from the relation between successive disturbances and the evolving internal condition of the trap.

The organization is therefore neither an instantaneous reflex nor an unrestricted accumulation process. If every disturbance remained indefinitely available, unrelated contacts separated by long intervals could accumulate without biological relevance. The finite persistence window allows temporally related disturbances to interact while isolated disturbances can decay without

commitment [66, 77]. Temporal decay should therefore not be treated merely as a failure of memory. This finite window is consistent with an adaptive organization in which temporally related disturbances can interact while widely separated disturbances do not accumulate indefinitely; that functional interpretation remains distinct from the direct empirical finding that the retained state decays across a finite interval.

The state-transition therefore depends upon a balance between retention and dissipation. The first event must persist. The retained state must remain modifiable. Additional input must be capable of increasing or reorganizing it. The state must also decay or reset when sufficient further input does not arrive.

This balance will later become important to the Stochastic Pump. The persistence of an altered biological condition cannot be understood independently of the active maintenance of membrane gradients, channel readiness, calcium regulation, and metabolic support [32, 77, 78]. At the same time, restoration mechanisms begin operating even while some consequences of the initiating event remain active. The system is therefore not simply storing a fixed quantity until a threshold is reached. Maintenance, propagation, decay, restoration, and renewed stimulation occur within overlapping intervals.

The calcium transient illustrates this overlap particularly clearly. Membrane repolarization may already be underway while cytoplasmic calcium remains elevated. After a short refractory interval, another qualifying stimulation can generate a further electrical and calcium event [77]. The later transient can then interact with the condition left by the earlier one. This means that persistence cannot be reduced to the duration of the action potential alone. The biologically relevant trace is distributed across several changing variables, and the full physical basis of integration may include more than any one measurable marker.

Calcium is therefore an important contributor and empirical indicator of the retained state, but it should not automatically be declared its sole carrier. Electrical history, ion-channel configuration, tissue tension, hydraulic readiness, and downstream signalling may also contribute to how the first event changes the response to the second. The mapped unit is the complete organized transition, not one isolated signal.

Threshold crossing also marks a change in the scope of the event. Before the threshold is reached, the disturbance is registered and retained without complete trap closure. Once the relevant conditions are satisfied, the system enters a coordinated mechanical transition involving both lobes and the wider capture apparatus. The output is relatively abrupt, but the preparation for it is temporally extended. This distinction prevents the visible snap from being mistaken for the whole event. Trap closure is the most obvious behavioural consequence, but the bounded state-transition begins earlier, with registration and persistence, and continues afterward through mechanical stabilization, regulatory change, and eventual restoration. The threshold is therefore a transition within the event rather than its absolute beginning.

The flytrap may also use different levels of repeated stimulation to regulate later stages of prey capture and digestion. Additional action potentials generated by continued prey movement can contribute to further hormonal, secretory, and digestive responses [65, 81]. The same general architecture therefore supports more than one biological commitment. The plant does not simply alternate between complete inactivity and one undifferentiated response. The number, timing, and persistence of successive disturbances can influence which phase of the capture sequence is recruited. This adds an important qualification to the idea of a binary switch. Rapid closure may appear all-or-none at the visible mechanical level, but the broader biological event contains graded and sequential organization. Signal magnitude, temporal spacing, calcium dynamics, mechanical response, digestive commitment, and recovery can vary even when the final transition appears abrupt. Threshold behaviour and graded biological organization are therefore compatible.

The flytrap's temporal integration should not, however, be identified with the human recursive audit described in Section 3. The plant's first event modifies the physical conditions under which a later event occurs. Human recursive processing additionally retrieves retained history, constructs self-reference, compares current events with symbolic and autobiographical content, and projects possible futures through psychological time. Both systems are historically dependent, but they are not organized at the same level. The flytrap demonstrates temporal persistence and integration without demonstrating narrative recursion. Its relevance lies precisely in showing that an earlier event can remain biologically active and shape later processing without being represented by a thinker or attributed to a self.

The comparison therefore supports a limited but important conclusion. Temporally extended integration is not exclusive to nervous systems, language, or autobiographical memory. A non-neural organism can preserve the consequence of an earlier disturbance, combine it with later input, and cross a biologically consequential threshold [65, 66, 77]. This does not establish that the flytrap has an inside view. It establishes that several structural elements of the proposed mapped event—persistence, historical dependence, integration, threshold transition, and bounded decay—can be physically instantiated without a recursive narrator.

The next question concerns why the resulting transition matters to the organism. Threshold crossing is not merely a formal relation among signals. Trap closure is an energetically consequential commitment whose value depends upon the plant's condition, the likelihood of prey, and the biological consequences of acting or failing to act [65, 79].

Section 4.4 therefore examines organism-state dependence and biological valuation.

4.4 Organism-State Dependence and Biological Valuation

The transition from registered disturbance to trap closure cannot be understood from the external stimulus alone. The biological effect of a trigger-hair contact depends upon the condition of the living system at the time the contact occurs. A qualifying

disturbance applied to a mature, excitable trap can initiate a rapidly propagating action potential and calcium wave. A comparable disturbance applied before that signalling architecture has developed does not produce the same event. Likewise, a second stimulation arriving while the consequence of the first remains active can contribute to closure, whereas the same stimulation arriving after sufficient decay may have little additional effect [66, 77, 80].

The relevant relation is therefore not simply:

$$\text{stimulus} \rightarrow \text{response}$$

It is more accurately described as:

$$\begin{gathered}\text{stimulus} + \text{current organismic state} \\ \rightarrow \\ \text{developing biological transition}\end{gathered}$$

The current state includes developmental maturity, membrane excitability, maintained electrochemical gradients, calcium dynamics, prior stimulation, mechanical readiness, metabolic condition, and the stage already reached within the capture sequence. This state dependence is one reason the flytrap is useful to the organism-relative framework. The plant does not respond to mechanical force from a neutral reference point. Each disturbance enters a living system with an existing history and a constrained range of possible transitions.

The first contact modifies that state. A second contact therefore acts upon an organism that is already different from the one that received the first. Once closure begins, later stimulation acts upon a still different configuration: the lobes have changed position, hydraulic and mechanical relations have shifted, the prey may be confined, and further electrical activity can recruit sealing and digestion. The biological consequence of each disturbance therefore depends upon its relation to the organism's current state and its position within the developing biological sequence.

This is the level at which biological valuation enters the account. Valuation, as used here, does not imply conscious judgment, reflective preference, or an internal subject deciding whether the stimulus is good or bad. It refers to organism-relative differential biological treatment of a disturbance through its relation to the organism's current condition, maintained organization, regulatory requirements, and available biological responses.

A disturbance that fails to exceed the mechanical requirements of the trigger hair may produce no wider transition. A single qualifying contact may be registered but allowed to decay. Under ordinary conditions, two appropriately timed contacts can generate the excitation history required for rapid closure, although the more fundamental relation is the required pattern of electrical activity rather than the literal number of external contacts. Continued prey-like movement after closure can recruit additional signalling, tighter sealing, gland activation, digestive secretion, and nutrient uptake [65, 81]. The same general class of mechanical event is therefore not treated uniformly; its biological consequences vary with timing, repetition, current state, and its relation to the larger capture process.

This differential organization is not added by a narrator. It is embodied in the structure of the plant. The trigger hairs, electrical excitability, calcium persistence, transition thresholds, mechanically primed lobe architecture, broader ion- and water-regulatory processes, jasmonate pathways, digestive glands, and restoration processes jointly determine which disturbances are amplified, which are allowed to decay, and which lead to increasingly costly commitment [65, 76–81, 84, 85]. The plant need not represent prey as an abstract object in order for prey-like stimulation to have a different biological consequence from isolated environmental contact. Repeated movement within the trap produces a pattern of disturbance that recruits a sequence evolved around prey capture and nutrient acquisition. Biological valuation is therefore enacted rather than contemplated.

This distinction prevents the term significance from becoming semantic or anthropomorphic. The significance of the disturbance does not consist in the plant forming a belief about what touched it. It consists in the disturbance acquiring different causal consequences within the organized life of the plant. A useful contrast is the difference between an isolated trigger-hair contact and continued stimulation from struggling prey. An isolated contact may generate one electrical and calcium event whose consequences decay without trap closure. Under ordinary conditions, two appropriately timed contacts can generate the excitation history required for the rapid snap, while a single mechanically appropriate deflection can under some conditions generate more than one action potential. Further stimulation after capture can sustain action-potential firing and contribute to jasmonate biosynthesis and signalling. These later processes support slower sealing of the trap and activation of the digestive glands [65, 81]. The response therefore escalates with the developing stimulation and excitation history, and each additional qualifying disturbance alters the physical state upon which later processes depend.

The sequence can be represented conceptually as:

$$\begin{gathered}\text{isolated disturbance} \\ \rightarrow \\ \text{registration without full commitment}\end{gathered}$$

repeated disturbance within the persistence window
→
rapid mechanical commitment

continued disturbance after capture
→
sealing, secretion, digestion, and nutrient uptake

The system thereby distinguishes, through its dynamics, between a disturbance that may be incidental and a pattern more consistent with moving prey. This organization has an evident biological advantage because trap closure is not free. Rapid closure releases stored elastic energy after rapid softening of the epidermal cell walls, while establishing the mechanically primed trap and restoring it afterward require biological work and broader cellular, ionic, hydraulic, and metabolic regulation [32, 77–79, 84, 85]. Electrical signalling disturbs ionic gradients that must later be restored. Closure and repeated trigger-hair stimulation increase respiration, reduce photosynthetic performance within the trap, and create additional costs associated with sealing, enzyme production, digestion, absorption, and eventual resetting [65, 79, 81]. A false closure therefore commits resources without guaranteeing nutritional return.

The temporal integration described in Section 4.3 is consistent with a cost-sensitive adaptive organization. Requiring the requisite excitation history within a finite interval allows temporally related disturbances to interact while isolated disturbances can decay without full commitment. This functional interpretation is consistent with the measured biological costs of closure and continued stimulation, but it should be distinguished from the direct empirical finding that the retained state decays across a finite interval. The threshold is therefore not merely a mechanism for producing an abrupt output; it is part of a cost-sensitive biological organization.

The same principle applies after the initial snap. Rapid closure need not yet constitute complete sealing. Continued internal movement can supply further stimulation, driving additional electrical and calcium activity and contributing to the transition toward tighter sealing and digestion [65, 81]. The broader capture sequence is consequently conditional rather than mechanically predetermined from the first contact. Each stage changes the plant and alters which later transitions remain available.

This does not mean the plant calculates energetic costs or expected nutritional gains. The cost-sensitive architecture is embodied in evolved physiological relations. Systems that committed indiscriminately to costly capture and digestion would waste resources, whereas systems that failed to respond to sufficiently reliable prey-like stimulation would lose access to nutrients. The resulting organization differentially links patterns of disturbance to consequences affecting the plant's maintenance and reproduction.

Biological valuation should therefore be distinguished from both simple causation and reflective evaluation. Every physical effect has causes, but not every causal chain is organized around the continued maintenance of a bounded living system. A stone may be displaced by impact, and a mechanical switch may change position, but neither event is biologically evaluated in relation to nutrient acquisition, energetic expenditure, tissue regulation, and later reavailability. The flytrap event occurs within an organism whose current state is altered by acting and whose future capacities depend upon how the transition is resolved.

At the same time, biological valuation does not require the reflective operations described in Section 3. There is no evidence that the plant autobiographically interprets the contact, experiences concern about wasted effort, or projects a future in which nutrient capture succeeds or fails. The valuation is primary and organism-relative. It is expressed through which disturbances alter the system, how long their effects persist, what additional stimulation they recruit, and which regulatory commitments follow. Human organisms retain these primary organism-relative biological relations, while narrator-level conscious evaluation additionally recruits memory, recognition, comparison, language, self-reference, and psychological time. A present disturbance may therefore be evaluated not only through its immediate biological consequences but through remembered injury, social meaning, anticipated loss, and its relation to the virtual self. The flytrap lacks evidence of this recursive organization. Its relevance lies in showing that differential biological consequence precedes reflective judgment.

The distinction can be stated precisely: primary biological valuation concerns organism-relative differential biological treatment of a disturbance through its relation to the living system's current condition, maintained organization, regulatory requirements, and available biological responses. Narrator-level evaluation concerns how an event is consciously interpreted, recognized, compared, owned, and projected through memory-dependent recursive processing operating in psychological time. The first does not require the second.

Organism-state dependence also prevents the threshold from being treated as a fixed property of the external world. A particular mechanical force is not inherently a closure command. Its effect depends upon whether the trap is mature, open, excitable, refractory, previously stimulated, chemically disrupted, mechanically capable of closing, or already engaged in later stages of capture. The threshold belongs to the relation between disturbance and organism, not to the disturbance alone.

This becomes especially clear under physiological perturbation. Electrical activity may be weakened or blocked. Calcium propagation may be altered. A trap may register contact without producing sufficient distributed activity for closure. During recovery, action potentials of reduced amplitude may reappear before the ordinary two-touch closure relation is restored [80]. The stimulus has not necessarily changed; the organismic conditions through which it becomes consequential have.

The same principle applies during the unperturbed hunting sequence. Before stimulation, the trap is open and receptive. After one action potential, it retains a transient alteration. After threshold crossing, it enters rapid closure. Continued stimulation recruits hormonal and digestive processes [65, 81]. Once digestion and recovery are complete, the system must return to a condition capable of responding again. At each stage, the biological consequence of additional input is constrained by the state already established.

This provides a more complete account of integration than simple addition. The trap does not merely sum identical signals in an unchanged container. Each signal participates in changing the system that receives the next one; integration is therefore transformative. The importance of this point extends beyond the flytrap. In living systems generally, the same physical input can produce different outcomes depending upon developmental stage, current regulation, retained history, energetic availability, competing demands, and prior perturbation. Organism-relative events are historically and physiologically conditioned. The flytrap allows this principle to be observed in a compact and measurable form.

None of these findings establishes that the plant consciously values prey or experiences the energetic cost of closure. The evidence supports the narrower claim that its signalling and response architecture is differentially organized around organismic consequence. This is an essential component of the proposed mapped event. Without organism-relative valuation, selective registration and threshold integration could be treated as abstract signal processing detached from the life of the system. In the flytrap, however, the transition changes photosynthesis, respiration, mechanical configuration, hormonal signalling, digestive activity, nutrient acquisition, and future responsiveness [65, 79, 81, 84–86]. The event matters biologically because it alters the condition and possibilities of the organism undergoing it.

The next stage of the analysis concerns the scale of that alteration. Threshold crossing does not produce only an electrical marker or a local change at the trigger hair. It commits the trap to a coordinated mechanical and regulatory transformation with measurable energetic consequences. Section 4.5 therefore examines commitment, biological cost, and the transition from an open receptive state to an altered capture state.

4.5 Commitment, Energetic Cost, and State Transformation

Threshold crossing changes the status of the flytrap event. Before the closure threshold is reached, mechanical disturbances have been registered, retained, and integrated, but the trap remains in its open receptive configuration. Once the relevant conditions are satisfied, the system enters a coordinated transition that alters its mechanical state, energetic demands, regulatory activity, and available responses.

The term commitment is used here in a strictly biological sense. It does not imply conscious choice, intention, or deliberation. It refers to a state-transition that carries the organism into a new configuration whose consequences cannot be reduced to the initiating stimulus and cannot be immediately reversed without further biological work.

An open trap is structurally prepared to receive further mechanical input. Its lobes are held in a mechanically primed configuration, its trigger hairs remain exposed, and its electrical and hydraulic systems are available for activation. Threshold crossing releases this prepared system into rapid movement. The visible snap is therefore not produced by the mechanical energy of the insect alone. The initiating disturbances trigger a transition within a plant that has already established the structural, hydraulic, electrochemical, and metabolic conditions required for closure.

Electrical excitation and associated calcium signalling precede the closure transition. Mechanical analyses established a major role for stored elastic energy and snap-through instability in the rapid movement, and recent in-situ hydraulic and mechanical measurements identify rapid softening of the epidermal cell walls as the immediate mechanical driver that releases this stored elastic energy. The snap occurs too quickly to be explained by water transport [66, 77, 84, 85]. Water and turgor relations remain relevant to the prepared physiological condition and broader regulation of the trap, but they should not be identified as the immediate motor of rapid closure. The trap thereby converts a relatively small sensory disturbance into a much larger coordinated movement.

The event can be represented conceptually as:

mechanical registration and temporal integration
→ threshold crossing
→ rapid epidermal cell-wall softening
→ release of stored elastic energy and snap-through
→ rapid change in lobe curvature
→ altered capture state

The rapid movement is only one part of this sequence. It is the conspicuous output of a transition prepared by earlier biological organization. This distinction is important because the energetic cost of the event should not be confused with the immediate mechanical source of every part of the snap. Mechanical analyses support the storage of elastic energy in the primed geometry and deformation of the open trap, which can be rapidly released during closure. Physiological processes establish and regulate the living conditions under which this mechanically prepared transition can occur.

The plant must nevertheless expend biological energy to establish, preserve, activate, and later restore the conditions upon which the movement depends. Metabolic work contributes to maintaining membrane potentials, electrochemical gradients, channel availability, calcium regulation, tissue hydration, osmotic relations, cellular integrity, and the open mechanically receptive state

[32, 77–79]. Additional work is required during electrical activation, hydraulic reorganization, later sealing, digestive secretion, nutrient transport, and recovery. The cost of closure therefore extends across the complete event rather than being confined to the instant when the lobes move.

This gives the term commitment a second meaning. Once the trap closes, resources that had supported an open receptive structure are redirected into maintaining and developing a capture state. The plant has altered both its present condition and the set of actions immediately available to it. A closed trap cannot simultaneously function as an open trap waiting for unrelated prey. Its trigger hairs, lobe geometry, mechanical relations, and physiological activity now operate within a different biological context. The transition temporarily removes that capture organ from its previous mode of availability.

The initial snap does not necessarily constitute complete capture. Rapid closure brings the lobes together and causes the marginal structures to interlock, but the trap may initially remain incompletely sealed. Further progression toward a tightly sealed digestive state depends upon continued biological activity after the snap. Continued movement within the trap supplies additional stimulation. Further action potentials and calcium activity can then recruit jasmonate signalling, slower closure, glandular activation, secretion of digestive enzymes, and the formation of a more tightly sealed digestive chamber [65, 81].

The capture event therefore develops through successive commitments:

open sensory readiness
→ rapid closure
→ continued internal stimulation
→ tighter sealing
→ digestive activation
→ nutrient absorption

These stages are neither identical nor automatically guaranteed by the first trigger-hair contact. Each depends upon the biological conditions established by the preceding stage and upon whether additional prey-like stimulation continues. This staged architecture prevents the event from being reduced to an all-or-none reflex. The visible snap is relatively abrupt, but the wider transformation is conditional, temporally extended, and biologically graded.

An isolated or misleading disturbance may recruit electrical activity without closure. Under ordinary conditions, successive appropriately timed contacts can generate the excitation history required for rapid closure without necessarily producing prolonged digestive commitment. Sustained stimulation from captured prey can move the system further into sealing and digestion. The plant's degree of commitment therefore increases as the biological sequence develops.

This progression is especially important because the costs also increase. Registration and one action potential disturb local and distributed physiological conditions. Rapid closure adds mechanical work and associated physiological demand. Continued action-potential firing sustains electrical and metabolic demand. Sealing, secretion, digestion, absorption, and eventual reopening extend the duration and scale of the event. The system does not incur the same cost at every stage.

Experimental measurements support this distinction. Trigger-hair stimulation and trap closure are associated with a temporary decrease in net photosynthetic activity within the trap and an increase in respiration. Continued stimulation simulating struggling prey produces further respiratory demand, stronger suppression of net photosynthesis, and changes in photosystem II photochemical efficiency, particularly within the digestive region [79]. These measurements show that electrical signalling and mechanical commitment are accompanied by directly observable changes in respiration, net photosynthesis, and photochemical efficiency within the active trap.

The response is nevertheless spatially organized. The most pronounced changes occur within the active trap and especially in regions involved in digestion rather than uniformly across the entire leaf [79]. The event therefore produces a coordinated but differentiated alteration of the plant. This spatial specificity matters because it indicates that the measurable cost is associated with the biological organization recruited by the event rather than simply with a nonspecific increase in whole-plant metabolism.

The trap becomes a locally reorganized physiological system. Its electrical state changes, its calcium and ionic conditions change, its geometry and hydraulic relations change, its respiratory activity changes, its photosynthetic performance changes, its glandular and hormonal activity may change, and its future availability changes. The event is therefore better described as a state transformation than as a movement alone.

The energetic cost should also not be treated as an incidental by-product. Maintaining and restoring excitable living tissue requires continual work. Action potentials disturb ionic distributions. Calcium entering the cytoplasm must later be removed, sequestered, or redistributed. Membrane potentials must be re-established [32, 77, 78]. Hydraulic and osmotic conditions must be regulated. Cellular ATP and other metabolic resources must be replenished. The visible response depends upon this underlying work even where the immediate mechanical movement draws upon energy stored before stimulation.

This provides an early biological basis for the Stochastic Pump developed in Section 6. The trap can remain ready, undergo a threshold transition, and later become ready again only because energy-dependent processes continually oppose leakage, restore gradients, regulate fluctuating variables, and rebuild the conditions required for further activity. The Stochastic Pump should not yet be identified with the entire flytrap event. Its role is to maintain and restore the physical conditions through which registration, persistence, integration, commitment, and recovery can occur. The bounded event includes the organization of that work in relation to a particular disturbance and its consequences for the organism.

Nor should energetic cost be identified directly with phenomenology. Trap closure consumes and redirects biological resources, but metabolic expenditure alone is not sufficient to establish an organism-relative inside view. Growth, repair, transport, and many other biological activities also require substantial energy. The significance of the flytrap lies not in the fact that it consumes energy, but in the way energy-dependent processes are organized within a bounded, historically conditioned, organism-relative transition.

The event has an identifiable initiating disturbance, a consequence of that disturbance persists, successive events are integrated, and a threshold changes the system's mode of operation. The transition produces coordinated mechanical and regulatory effects, its costs and consequences extend beyond the initiating contact, and the system must later resolve and restore itself. Energetic demand belongs to this complete organization. It is necessary to its implementation but does not independently define its phenomenal status.

This distinction protects the framework from a simple metabolic identity claim. A larger energy expenditure does not automatically imply richer phenomenology, and a small energy expenditure does not automatically imply its absence. The relevant question concerns how physical work participates in the complete structure of the organism-relative event. In the flytrap, threshold crossing reorganizes a prepared biological system around prey capture. The resulting work is directed into electrical propagation, mechanical movement, continued sensory responsiveness, sealing, digestion, nutrient acquisition, and later restoration. The cost is therefore functionally structured rather than merely quantitative.

Commitment also introduces asymmetry into the event. Before threshold crossing, the trap can allow the consequences of isolated stimulation to decay while remaining open. After closure, it cannot return instantaneously to its former state simply because stimulation has stopped. The transition has changed the plant's material configuration. If no suitable prey is present, the trap must still undergo reopening and recovery [86]. The energetic expenditure associated with the false closure cannot be retrieved merely by reversing the initiating mechanical disturbance. If prey is present, the trap proceeds through an extended digestive process before becoming available again [65, 81, 86]. The closed state therefore has biological consequences that persist after the original trigger-hair contact has ended.

This irreversibility should be understood at the level of the biological sequence rather than as a claim that every microscopic process is absolutely irreversible. The organism can return to a functionally similar open state, but doing so requires a new series of active processes [86]. The path back is not simply the initiating event run in reverse. This is what makes the transition bounded and consequential. The organism begins in one prepared state, is disturbed and altered, crosses a threshold, enters a new state with different constraints and demands, and must then perform additional work to resolve the event and regain future availability.

The transformation also clarifies why visible behaviour alone is an incomplete measure of the biological process. Two traps may both appear closed while differing in electrical history, calcium state, metabolic demand, degree of sealing, digestive activation, prey presence, and recovery trajectory. The external outcome "closed" does not specify the complete internal organization of the event. Likewise, failure to close does not identify the precise point of failure. Registration may have occurred while persistence was insufficient. Integration may have remained below threshold. Electrical propagation may have been weakened. Mechanical deformation may have been impaired despite preserved action potentials. Stored mechanical readiness may have been altered. The same visible result can arise from disruption at different stages.

A scientifically useful mapped unit must therefore include more than the final movement. It must encompass the organized transition from prepared readiness through disturbance, persistence, integration, commitment, altered state, and resolution. The flytrap's value as a boundary case lies partly in the accessibility of these stages. Electrical events, calcium dynamics, lobe movement, respiration, photosynthesis, hormonal signalling, gland activation, and recovery can be examined separately and then related within one biological sequence [65, 66, 77–81, 84–86]. This creates the possibility of distinguishing the components that initiate the event from those that sustain, amplify, complete, and restore it.

The evidence supports a limited but important conclusion. Threshold crossing in the flytrap does not merely produce an externally visible response. It commits a bounded living system to a coordinated reorganization with measurable mechanical, electrical, calcium-dependent, metabolic, and regulatory consequences. That conclusion still does not establish flytrap phenomenology. It establishes that the proposed comparative event has the depth required to be more than simple detection followed by output. The plant's condition is transformed, its resources are redistributed, and its later possibilities are constrained by what has occurred.

The next question concerns how the event ends and how the trap becomes available for future stimulation. Closure alone is not resolution. Electrical gradients, calcium conditions, metabolic resources, mechanical configuration, and receptive capacity must all be restored or reorganized across different timescales. Section 4.6 therefore examines resolution, resetting, and renewed biological availability.

4.6 Resolution, Resetting, and Renewed Availability

Trap closure does not complete the flytrap state-transition. Once the lobes have moved, the plant remains electrically, chemically, mechanically, and metabolically altered. The event can be considered resolved only as these changes are either restored toward their earlier conditions or incorporated into a new stable state from which the organism can continue functioning. Resolution must therefore be distinguished from visible response. The snap is rapid; electrical restoration proceeds over seconds; the cytoplasmic calcium consequence decays across tens of seconds; measured changes in photosynthetic and respiratory activity can recover toward their earlier conditions over minutes after stimulation ceases; mechanical reopening occurs on an hours timescale;

when prey is retained, sealing, digestion, absorption, and eventual reopening may extend across several days [65, 77, 79, 81, 86]. The flytrap does not possess one universal reset point at which every affected variable simultaneously returns to baseline. Recovery is distributed across multiple interacting processes and timescales.

This staged organization can be represented conceptually as:

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threshold crossing
→ rapid mechanical transition
→ continued electrical, chemical, and regulatory activity
→ restoration or further biological commitment
→ renewed functional availability
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The exact path depends upon what follows closure. A trap containing active prey enters a different recovery trajectory from one triggered by an incidental disturbance. Continued movement sustains action potentials and promotes sealing and digestion. In the absence of sufficient continuing stimulation or useful prey, the trap does not proceed through the same extended digestive sequence [65, 81, 86]. Resolution is therefore conditional upon the developing biological history of the event.

The earliest restorative processes begin during the electrical signal itself. An action potential disturbs the membrane potential through regulated ion movement. Depolarization is followed by repolarization and, under ordinary conditions, a temporary hyperpolarization before the membrane returns toward its resting state. Potassium-dependent conductances contribute to repolarization, while plasma-membrane AHA-type proton pumps contribute to the transient hyperpolarization phase. The trigger-hair-associated KDM1 potassium channel also contributes to restoration of potassium conditions and recovery of mechanosensory excitability [77, 78]. These processes operate together with additional channels, pumps, and transporters rather than constituting a single mechanism that restores the entire electrical state. The electrical event is therefore not terminated merely because depolarization has reached its peak. It must be actively resolved.

A simplified sequence is:

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resting electrochemical organization
→ stimulus-induced ion movement
→ membrane depolarization
→ repolarization and hyperpolarization
→ restoration toward resting ionic conditions
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The return toward resting potential should not be interpreted as a passive relaxation requiring no biological work. Ion gradients exist because the living system continually maintains unequal distributions across cellular membranes. Once electrical signalling disturbs those distributions, channels, pumps, transporters, and metabolic pathways participate in their restoration [32, 77, 78]. The system must oppose diffusion and leakage if it is to become electrically available again.

The calcium signal follows a related but distinct trajectory. Cytoplasmic calcium can remain elevated after rapid membrane depolarization has begun to resolve. It subsequently declines through regulated calcium-handling processes, while the precise contributions of extrusion, sequestration, redistribution, and intracellular stores remain incompletely resolved [77, 82]. This slower decline is part of what allows the first stimulus to influence a later one. It also means that recovery of the membrane voltage alone does not establish complete restoration of the pre-stimulus state. A trap may have repolarized electrically while retaining a chemically consequential trace of what occurred.

Resolution therefore does not mean the immediate erasure of every consequence. The temporary persistence of altered calcium is strongly implicated in temporal integration and provides a directly measurable component of the retained state [66, 77]. At the same time, indefinite persistence would prevent the system from distinguishing new events from old ones. The retained state must eventually decay or be actively cleared if the trap is to regain its ordinary threshold relation.

This creates a necessary balance between sufficient persistence for integration and sufficient restoration for renewed discrimination. Without persistence, successive disturbances could not interact. Without restoration, prior disturbances would accumulate without an effective boundary. The bounded character of the event depends upon both.

Electrical and calcium recovery are only part of the process. Trigger-hair stimulation and closure also alter respiration and photosynthetic function within the trap. Experimental measurements show increased respiratory activity and reduced photosynthetic performance during closure and continued stimulation. When mechanical irritation stops, these variables recover toward their earlier conditions [79]. The event therefore temporarily reorganizes the energetic economy of the capture organ and then releases that demand as the initiating disturbance ceases or the biological task changes.

Metabolic recovery does not necessarily occur at the same rate in every tissue or under every condition. The greatest changes are associated with the active regions of the trap, particularly where signalling and digestive activity are concentrated [79]. The return toward baseline is consequently structured rather than uniform.

This is important because the term resetting can otherwise suggest that one central mechanism restores the whole organism at once. In reality, different components are restored through partially distinct processes: membrane potential through coordinated ion transport; cytoplasmic calcium through regulated calcium-handling processes; metabolic resources through ATP production and respiratory activity; hydraulic conditions through regulated physiological processes involving ion and water relations; mechanical readiness through reconfiguration of trap geometry, with water, turgor, growth, and elastic mechanics contributing in

ways that remain incompletely resolved; photosynthetic performance through recovery from signalling-associated inhibition; and capture capacity through reopening and restoration of the receptive configuration [32, 77–79, 82, 86]. These processes are coordinated, but they are not identical.

Mechanical resolution occurs on a much slower scale than the action potential. Rapid closure changes the curvature and relation of the two lobes. Reopening requires a prolonged reconfiguration of trap geometry rather than simply the elastic reversal of the snap, and the relative contributions of growth, water and turgor relations, and elastic mechanics can vary with trap geometry and remain incompletely resolved [86]. The trap must be returned from a closed or sealed configuration to an open state in which the trigger hairs are exposed and the lobes are again mechanically prepared for capture. This return is an active biological transition.

Where suitable prey has been retained, the trap remains closed while digestion proceeds. Mechanical and chemical stimulation from the prey sustains signalling, glandular secretion, nutrient transport, and the maintenance of the digestive chamber. Only after that process has been resolved can the trap reopen and become available for another capture event [65, 81, 86, 87]. The functional boundary of the event may therefore extend far beyond the initiating trigger-hair contacts.

This raises an important issue for defining the mapped unit. The flytrap transition can be described at more than one legitimate scale. At the narrowest scale, one can study an individual action potential and its repolarization. At an intermediate scale, one can study the excitation sequence culminating in rapid closure. At the broadest scale, one can study the complete capture cycle from open readiness through registration, closure, sealing, digestion, reopening, and renewed availability. These are nested events rather than competing descriptions.

The appropriate boundary depends upon the phenomenon under investigation. Electrical excitability can be studied through the action-potential cycle. Threshold integration requires the relation among successive excitation events and the retained biological state. Organism-level resolution requires the wider sequence through which the trap regains a functionally available state. For the present framework, the mapped unit cannot be reduced to the shortest measurable component. The complete organism-relative state-transition includes the way local electrical and chemical events alter the wider condition and possibilities of the living system. The event begins when a qualifying disturbance becomes biologically registered. It develops through persistence and integration, changes mode at threshold crossing, and resolves only when its consequences have been stabilized or the system has regained the capacity for a further bounded event.

This does not require that the trap return to an exact physical duplicate of its original condition. Functional resetting does not require exact restoration of the preceding physical microstate. Reopening can restore the organization required for renewed capture even though physical work has occurred and, depending upon the course of the event, the plant's energetic state, nutrient condition, physiological history, or longer-term biological state may also have changed [65, 79, 86, 87]. Resetting is therefore functional rather than absolute. A trap is reset when the relevant conditions for renewed registration, integration, and response have been restored, not when every molecule occupies its former position.

The distinction can be stated as:

$$\text{functional restoration} \neq \text{exact reversal of history}$$

Instead:

$$\text{re-establishment of the organization required for renewed availability}$$

These expressions are conceptual. They identify the difference between returning to precisely the same physical state and recovering the capacity to perform the relevant biological function again.

The restored trap is therefore both continuous with and different from the trap that existed before the event. Its general capture organization may have returned, but the process of capture has altered its energetic state, physiological history, and potentially its nutrient condition. Resolution does not erase the event. It incorporates its consequences into the continuing organism.

This is especially clear after successful digestion. The plant does not merely return to its earlier condition. Nutrients obtained from the prey can become available to later metabolism, growth, and reproduction [87–89]. The resolved event has changed the organism in a way that may increase its future capacities. A false or unsuccessful closure produces a different result. Resources have been spent without the same nutritional gain. The trap may regain functional availability, but the energetic consequences of the event cannot be undone simply by reopening. The path back to readiness therefore depends upon the outcome of the state-transition.

This asymmetry is characteristic of living events. The organism may restore a functional variable while retaining the consequences of the history that required restoration. Electrical gradients can be rebuilt, but ATP has been consumed. The trap can reopen, but mechanical and metabolic work has occurred. Photosynthesis can recover, but carbon costs have been incurred [32, 78, 79, 86]. The system can become responsive again, but it is not literally unchanged. Resolution should therefore not be confused with cancellation.

This point also clarifies why the return to baseline is empirically informative. If the event were only a passive mechanical snap, recovery would consist primarily of structural reversal. Instead, restoration can be examined through electrical excitability, action-potential shape, membrane potential, calcium decay, respiratory activity, photosynthetic performance, hydraulic function, mechanical reopening, and later responsiveness [77–81, 86]. Different recovery profiles reveal different components of the underlying organization.

A perturbation may allow registration while preventing propagation. Another may preserve electrical activity while impairing mechanical closure. A trap may regain weak action potentials before recovering the ordinary threshold relation required for rapid movement. Photosynthetic and respiratory variables may return toward baseline on a different schedule from mechanical reopening [79, 80, 86]. Such dissociations show that recovery is not a single undifferentiated capacity.

They also make the flytrap scientifically valuable. The developing event can be interrupted, and the return of its components can be observed. This allows investigators to distinguish: the restoration of local excitability; the return of distributed signalling; the recovery of threshold integration; the recovery of mechanical response; and the re-establishment of complete functional availability. These stages should not be mistaken for evidence of separate inner entities. They identify distinguishable operations within one living system.

The same reasoning will later be relevant to more complex organisms. Recovery of one measurable function need not imply restoration of every level of biological organization. Conversely, temporary failure of a downstream output need not identify which upstream component remains intact. The comparative value lies in the shared methodological principle: recovery should be decomposed according to the functions being restored.

The flytrap makes this decomposition unusually visible. Its trigger hairs can regain sensitivity. Its action potentials can regain ordinary amplitude and duration. Its calcium dynamics can regain their characteristic temporal relation. Its trap can regain the ability to close after the usual stimulation pattern. Its metabolic variables can return toward baseline. Its lobes can reopen [66, 77–80, 86]. The capture organ can become available again. Each marks a different aspect of resolution.

The organism-relative framework therefore treats resolution as an active reorganization of the living system after consequential disturbance. The event is not fully characterized by the production of an output. It includes the biological work required to contain, complete, and recover from that output. This is where the need for the Stochastic Pump becomes increasingly apparent.

The flytrap must continually maintain its gradients before stimulation, restore them after electrical activity, regulate calcium and hydraulic conditions, replenish metabolic resources, and reconstruct the readiness required for future events [32, 77–79, 82, 86]. These operations occur under thermal noise, molecular fluctuation, leakage, and changing environmental conditions. No one molecular pump performs the complete process. Ion pumps, channels, transporters, metabolism, hydraulic regulation, and feedback together sustain the system's continuing availability. Section 6 will formally define this distributed maintenance-and-restoration function as the Stochastic Pump. At the present stage, the flytrap provides its concrete biological basis.

The Pump is required not only after the event. It is already operating before stimulation to maintain the open, excitable, mechanically prepared state. It continues during the event as gradients are disturbed and regulatory demands change. It contributes afterward as the system restores or reorganizes the conditions necessary for continued life and future response.

The relation can therefore be summarized as:

pre-event maintenance
→ event-specific recruitment and disturbance
→ active restoration and reorganization
→ renewed biological availability

The Stochastic Pump does not replace the bounded state-transition and should not be identified with phenomenology by itself. It describes the distributed work through which the physical conditions of the event remain possible. The complete event includes how that maintained capacity is recruited, integrated, valued, transformed, and resolved in relation to a consequential disturbance.

Resolution is essential to this architecture because a system incapable of recovery would undergo only a terminal transition. A living organism must not merely respond; it must preserve or rebuild the capacity to respond again. The flytrap illustrates this principle at a tractable scale. The capture organ can temporarily leave its receptive state, perform a costly and condition-dependent transition, and later regain a functionally similar readiness without erasing the biological consequences of what occurred [65, 79, 81, 86, 87].

None of this demonstrates that the plant experiences restoration, effort, or renewed availability. It establishes that the flytrap event possesses a complete biological arc: prepared readiness; selective registration; temporal persistence; integration; organism-relative valuation; threshold-dependent commitment; state transformation; active resolution; and renewed functional availability.

The final task of Section 4 is to state precisely what this comparative case contributes to the theory and where its evidential limits remain. Section 4.7 therefore distinguishes what the flytrap establishes biologically from what cannot yet be inferred about phenomenology.

4.7 What the Flytrap Establishes—and What It Does Not

The Venus flytrap provides a biologically tractable case in which the components of a bounded organism-relative state-transition can be examined without the additional architecture of language, autobiographical memory, narrative ownership, or human report. The comparison has identified a coherent sequence: prepared biological readiness; selective registration of mechanical disturbance; electrical and calcium-dependent propagation; persistence of a prior event across time; integration of successive disturbances; threshold-dependent commitment; organism-state-dependent differential biological consequence; coordinated mechanical and regulatory transformation; energetic and metabolic consequence; and active resolution and renewed availability [65, 66, 76–81, 83–87].

These relations are not inferred solely from the visible act of trap closure. They can be approached through distinct measurements of trigger-hair sensitivity, membrane potential, action-potential propagation, calcium dynamics, temporal summation, mechanical deformation and reopening dynamics, respiration, photosynthetic performance, hormonal signalling, digestive activation, and recovery [65, 66, 76–81, 83–87]. The flytrap therefore establishes that a non-neural organism can instantiate considerably more than an instantaneous stimulus-response relation. A transient disturbance can leave a physical consequence that remains biologically effective; a later disturbance can interact with that retained state; the combined history can carry the system across a threshold; and threshold crossing can reorganize a bounded living system in ways that alter its continuing condition and available biological responses.

Within the present framework, this organism-relative differential organization is the relation described as biological valuation. The measured state-dependence is empirical; its characterization as valuation is the theoretical mapping applied to that organization. The transition can impose measurable costs and require active restoration before the system becomes functionally available again [78, 79, 86]. These biological operations occur in a non-neural organism without language or behavioural report and for which there is no evidence of autobiographical self-reference or recursive audit.

This finding supports the architectural distinction developed in Section 3. Registration, persistence, integration, state-dependent differential biological consequence, commitment, and resolution are not created by narrative ownership. They can occur within a living system that provides no evidence of an autobiographical self or recursive audit. The flytrap therefore carries genuine explanatory weight: it demonstrates that several relations proposed to underlie primary organism-relative events are not proprietary features of human cortical anatomy. Electrical excitability, calcium-associated temporal persistence, threshold integration, state-dependent differential response, energetically consequential state transformation, and active restoration can be implemented through a radically different biological substrate [65, 66, 76–81, 83–87].

The conclusion must nevertheless be stated carefully. The flytrap does not establish that neural and plant processes are anatomically equivalent. A trigger hair is not a neuron; a propagating plant action potential is not a cortical representation; calcium summation in a trap is not a human recursive audit; trap closure is not a behavioural report; and jasmonate signalling is not reflective evaluation. The absence of these equivalences does not weaken the comparative argument. It defines its proper level.

The comparison concerns relations within an organized biological event rather than identity between particular anatomical structures. At that relational level, both neural and non-neural organisms may depend upon maintained gradients, selective registration, state persistence, integration across time, threshold-sensitive transition, coordinated response, metabolic support, and restoration. The physical components and scale of organization can differ while similar organizational relations can nevertheless be instantiated across radically different biological substrates.

The flytrap therefore challenges a purely anatomical boundary around the explanatory target. A theory that makes neural tissue a necessary boundary must explain which neural organization is indispensable and why the more general relations present in non-neural organisms are insufficient. It is not enough to point to the presence of neurons, cortex, thalamocortical recurrence, or behavioural report. The theory must identify what those structures contribute that is absent from the non-neural event and why that contribution is necessary for phenomenology rather than for differentiation, memory depth, flexible action, recursive ownership, or report. This places a legitimate explanatory burden on neural exclusivity without presuming that the burden cannot be met.

Human neural systems provide forms of organization that the flytrap lacks. They support immense differentiation of sensory content, rapid recurrent interaction, multimodal integration, learning, flexible action, counterfactual projection, long-term memory, recursive self-reference, and report [5–10, 30, 64, 68, 69, 72]. The comparative argument does not deny these discontinuities. It asks whether they mark the beginning of phenomenology itself or whether they elaborate, differentiate, stabilize, and recursively organize a more basic organism-relative architecture. The flytrap cannot answer that question by itself; it makes the question unavoidable and biologically precise.

The case also prevents the framework from defining primary phenomenology through human capacities that are already known to belong to later recursive organization. If verbal report, autobiographical ownership, or explicit introspection were treated as necessary conditions, the theory would collapse primary phenomenology back into the narrator whose derivative status has already been established. The flytrap shows that the underlying biological functions can be studied without those additions.

The opposite error would be equally serious. The presence of electrical signalling, metabolism, stimulus discrimination, or adaptive behaviour does not by itself establish an organism-relative inside view. These features occur across a wide range of biological systems, and many also have engineered analogues [32, 82]. The framework cannot therefore reason that because the flytrap detects a stimulus, uses electricity, and expends energy, it is conscious. That inference would be scientifically inadequate.

No isolated feature identified in the case is sufficient on its own. Action potentials alone are not phenomenology; calcium waves alone are not phenomenology; metabolic cost alone is not phenomenology; threshold crossing alone is not phenomenology; and adaptive function alone is not phenomenology. The proposed target is the complete bounded organism-relative organization in which these processes participate.

Even the presence of that complete organization would not justify attributing a specifically human phenomenal content to the plant. Nothing in the evidence examined here establishes that the flytrap experiences pain, fear, hunger, visual imagery, effort, anticipation, ownership, or deliberation. Such terms refer to highly differentiated forms of animal and human organization for which the plant provides no corresponding evidence.

The framework must therefore distinguish the possible occurrence of a minimal organism-relative inside view from claims about what that inside view would be like. These are separate questions. The first concerns whether the relevant biological event possesses an organism-relative phenomenal aspect; the second concerns the character, differentiation, richness, and temporal organization of that aspect. Evidence concerning similar event structure across different biological substrates may bear upon the first question without supplying an answer to the second.

The flytrap cannot verbally report an event, and no external measurement can directly reproduce the proposed inside view for an investigator. This limitation is not unique to plants. External measurements of another human nervous system also do not contain that individual's pain, colour, or fear as an object available to the observer. In humans, report and shared biological organization provide additional routes of inference [30, 64, 73, 75]. In the flytrap, those routes are far more limited. The evidential burden must therefore remain correspondingly higher and the phenomenal claims correspondingly restrained.

The flytrap should consequently not be presented as proof of plant consciousness. Its strongest role is as a comparative constraint upon the identity proposition. If the proposition applies only to human neural systems, the theory must specify the organization that establishes that boundary. If it extends to every metabolic or regulatory event, it becomes too broad to be scientifically useful. If it includes the flytrap solely because the plant behaves adaptively, it risks anthropomorphic overextension. The framework must instead identify a bounded class of organism-relative state-transitions with enough precision to distinguish the proposed mapped event from both simple reactivity and general biological maintenance.

The flytrap helps impose that discipline because its organization falls near the disputed boundary. It is not a passive physical object, it is not an instantaneous chemical reflex, and it is not a human nervous system. It is a bounded living system capable of retaining the consequences of earlier disturbance, integrating them with later input, changing state according to organismic consequence, and actively restoring the conditions required for renewed response [65, 66, 76–81, 83–87]. Any proposed boundary must explain why that organization is either sufficient, insufficient, or incomplete.

The case also clarifies the status of energetic evidence. The measurable costs of electrical activity, trap closure, continued stimulation, sealing, digestion, and recovery show that the state-transition is physically implemented and thermodynamically constrained [32, 65, 78, 79, 81, 86, 89]. They provide external access to the work required to maintain and transform the organism, but they do not establish that energetic expenditure is itself the phenomenal aspect. Metabolic work is necessary for the flytrap event, yet metabolism also supports growth, repair, synthesis, and transport. The explanatory target therefore cannot be reduced to energy magnitude alone; what matters is how energy-dependent processes are organized within the bounded event.

The same restriction will apply when the comparison is extended to neural systems. Human brains consume energy continuously, including during processes that need not correspond to a specific phenomenal event [33–35, 42]. The relevant scientific question is not how much energy is consumed in the abstract, but how maintained physical work is recruited into registration, persistence, integration, valuation, temporal development, and resolution.

The flytrap therefore supplies a concrete biological foundation for the later account of the Stochastic Pump without prematurely identifying the Pump with phenomenology. Its ion pumps, channels, metabolic pathways, hydraulic regulation, calcium handling, and restorative processes maintain the conditions under which the state-transition can occur [32, 77–79, 82, 86]. They implement and sustain the event but do not, in isolation, define the complete mapped unit. The Pump is necessary to the Grind, but pump activity alone is not sufficient for the Glow.

The final evidential status of the flytrap can therefore be stated at three levels. First, the biology establishes that the plant instantiates a temporally extended, integrated, state-dependent, energetically consequential, and actively resolved response architecture [65, 66, 76–81, 83–87]. Second, the comparative analysis establishes that several relations proposed to be fundamental to the mapped event can occur in a non-neural organism without behavioural report and without evidence of narration. Third, the organism-relative identity proposition raises the further hypothesis that a sufficiently complete event of this kind possesses an inside view. The first conclusion is empirical, the second is comparative and architectural, and the third remains the theoretical claim to be constrained and tested. Keeping these levels separate preserves the explanatory force of the flytrap without making the evidence carry more than it can support.

The plant is therefore neither a decorative analogy nor a decisive proof of consciousness. It is a boundary case that exposes the biological structure of the proposed event and forces the theory to define its inclusion and exclusion criteria. The comparison now has to be widened. The question is no longer whether the flytrap resembles a human in anatomy or behaviour, but which organizational relations are instantiated across radically different living substrates, which are amplified by nervous systems, and which appear only with the emergence of recursive narration. That distinction provides the basis for the cross-substrate analysis that follows.

5.0 Continuity and Discontinuity Across Biological Substrates

5.1 From Anatomical Difference to Functional Relation

The Venus flytrap differs profoundly from the human organism. It has no brain, neurons, synapses, thalamocortical system, or autonomic nervous system, and there is no evidence of language, autobiographical memory, or a recursive narrator. Its capture organ is constructed from plant tissue and operates through plant-specific electrical, chemical, hydraulic, metabolic, and mechanical processes. These differences are fundamental. Any comparison that ignored them would reduce distinct forms of biological organization to a superficial resemblance.

The purpose of the comparison is therefore not to portray the flytrap as a simplified nervous system or to describe plant signalling as neural processing under another name. The relevant question is narrower: can different living substrates instantiate some of the same causal relations within a bounded organism-relative state-transition?

Section 4 established that the flytrap capture sequence includes selective registration, a retained physiological consequence of prior stimulation, integration across a finite interval, state-dependent threshold crossing, coordinated mechanical transformation, metabolic and regulatory consequences, and eventual restoration of functional availability [65, 66, 77, 79, 80, 84–86]. These findings do not establish that the plant event is equivalent to a human percept, thought, or decision. They do, however, permit the event to be analysed at a level other than anatomy alone.

This shift is necessary because biological functions are not defined solely by the material composition of the structures that perform them. Physical implementation remains indispensable, but the significance of a mechanism also depends upon the role it performs within the wider organism. A receptor converts a relevant disturbance into a biologically effective change. A retained trace allows an earlier event to alter the consequences of a later one. Threshold crossing reorganizes the system's available responses when developing conditions become sufficient for a wider transition. A restorative process returns the organism toward renewed functional availability after disturbance. Such relations can be implemented through different molecular, cellular, and anatomical arrangements without becoming physically interchangeable [67, 93].

The framework therefore rejects two opposing errors. The first is anatomical essentialism: the assumption that a relation can be relevant to phenomenology only when it is implemented by a familiar neural structure. Neurons, synapses, recurrent networks, and thalamocortical organization may prove indispensable to highly differentiated animal phenomenology, reflective access, or report. Their necessity, however, cannot be established merely by identifying them as neural. The relevant organization must be specified, and the reason it is indispensable must be shown.

The second error is substrate-indifferent functionalism: the assumption that any system displaying a comparable input-output pattern thereby instantiates the same event. A mechanical trap can close after pressure is applied. A thermostat can cross a switching threshold. A computer can retain earlier input and combine it with later data. These systems instantiate selected formal relations, but that alone does not establish the bounded organism-relative organization proposed here. The present framework concerns living systems whose continued existence depends upon the active maintenance of nonequilibrium conditions and whose relevant state-transitions alter the organism's own condition and biological possibilities, potentially including regulatory demand, resource allocation, available responses, and future capacity for response [24, 32].

> **The appropriate comparison is therefore neither purely anatomical nor purely abstract. It is biological and relational.**

Three levels must remain distinct. The first consists of the physical mechanisms that implement the event. In the flytrap, these include trigger hairs, mechanosensitive cells, ion channels, membrane potentials, calcium dynamics, proton pumps, hydraulic relations, tissue geometry, hormonal signalling, metabolic pathways, and restorative transport processes [65, 77–82, 84–86]. In humans, implementation includes sensory receptors, excitable membranes, neurons, glial cells, synapses, recurrent circuits, vascular and metabolic support, autonomic and endocrine regulation, muscles, and distributed bodily feedback [23, 24, 33–35, 42, 64, 90–92]. These components are not interchangeable, and the differences between them constrain what each organism can do.

The second level consists of the causal relations into which those components are organized. A living system is maintained in a condition of readiness. A disturbance is selectively registered. Its consequences extend beyond the point of initial contact. Some alteration persists long enough to affect later processing. New input interacts with the changed state of the organism. The developing condition may cross a threshold into wider commitment. The transition alters the organism's regulatory and energetic condition, and restorative processes eventually recover sufficient availability for subsequent events. These relations can be compared even where their physical implementation differs substantially.

The third level is the organism-relative identity proposition. The framework proposes that a sufficiently complete bounded event of this kind has an organism-relative inside view. That proposition is not established by identifying one shared molecule, one

physiological component, or one formally comparable function. It concerns the organization of the complete event. Shared mechanisms do not automatically establish shared event structure; shared event structure does not imply identical phenomenal character; and neither alone proves the identity proposition.

Maintaining these distinctions prevents comparative biology from becoming analogy by resemblance. A flytrap trigger hair and a human sensory receptor both participate in transduction, but they are not the same organ and do not possess the same sensitivity, connectivity, temporal resolution, or downstream capacities. The relevant similarity lies in the relation through which a local disturbance becomes biologically available to a wider living system.

The same caution applies to persistence. A retained physiological state that includes calcium-related dynamics in the flytrap should not be equated with human working memory, autobiographical memory, or conscious recollection. The flytrap retains a biologically effective consequence of earlier stimulation, allowing subsequent input to act upon an altered state. Humans preserve history across vastly greater timescales through recurrent activity, synaptic change, molecular modification, distributed memory systems, and reconstructive access [5–10, 68, 69, 94]. The mechanisms and capacities differ radically, but both systems exhibit historical dependence: the consequences of a present disturbance depend partly upon what the organism has already undergone.

Threshold crossing must be treated with equal precision. Closure in the flytrap is not a plant form of deliberation. The trap does not compare reasons, form intentions, simulate alternatives, or consciously select an action. Human organisms can integrate sensory evidence with interoceptive condition, memory, predicted outcomes, social meaning, and self-referential concern before producing behaviour [9, 10, 23, 24, 68, 69]. Nevertheless, both systems exhibit the more general relation in which accumulated biological conditions reorganize the range of available responses.

The central methodological claim is therefore shared or recurrent biological relation, not identity of mechanism or capacity.

The term conserved should also be used carefully. In evolutionary biology, it often refers to genes, traits, or structures retained through common descent [67, 93]. The present argument does not require the flytrap capture system and the human nervous system to be homologous instances of one specialized ancestral architecture. The intended claim is that differently organized living systems can confront comparable physical problems and solve them through recurrent causal relations. For this reason, the present comparison will generally refer to shared organization or recurrent biological relation rather than conserved mechanism.

These common problems include remaining selectively responsive without reacting indiscriminately, preserving the consequences of a disturbance long enough for later events to matter, integrating new input with the current biological state, crossing from readiness into commitment, coordinating local change with wider organismic transformation, and restoring the capacity for continued responsiveness.

The flytrap and the human organism solve these problems at dramatically different levels of differentiation. The flytrap capture sequence is specialized, comparatively stereotyped, and organized around a narrow class of mechanical disturbances and capture-related outcomes. Human events can integrate differentiated sensory, interoceptive, affective, mnemonic, motor, social, linguistic, and self-referential information. They can be altered through learning, symbolic meaning, long-range anticipation, counterfactual modelling, and recursive evaluation [9, 10, 23, 24, 68–72].

A shared relational scaffold therefore does not imply equivalence. Biological organization can scale through several distinct dimensions: the diversity of registered variables, the spatial distribution of integration, the duration and depth of retained history, the number of available state-transitions, behavioural flexibility, learning, recurrence, representational differentiation, recursive self-reference, and the temporal range over which consequences can be projected. Scaling does not mean enlarging one identical mechanism. It means that a basic organization can become more differentiated, distributed, temporally extended, flexibly coupled, and recursively available.

The comparative unit must therefore be larger than any individual molecule or signal. Calcium, ion channels, ATP-dependent pumps, and electrical gradients occur in both plants and animals, but their presence alone does not define the event [32, 77, 78, 82, 90, 91]. The same molecular process can participate in signalling, secretion, contraction, transport, development, repair, or cell death. Its explanatory significance depends upon the role it performs within the complete state-transition.

For the same reason, the event boundary cannot be drawn solely around visible output. Trap closure is one phase of the flytrap event, just as verbal or motor report is one possible phase of a human event. A trap may register and retain stimulation without closing. Within the present architecture, a human primary organism-relative event need not produce immediate report [30, 31, 64, 66, 73, 75, 80]. Conversely, similar external outputs may arise from different internal organizations. Comparative analysis must therefore track the developing transition rather than classify systems by stimulus-response resemblance.

The relevant unit includes maintained readiness, consequential registration, persistence, integration with the present condition of the organism, coordinated transformation, resolution, and renewed availability. No isolated molecule, electrical discharge, metabolic expenditure, or visible behaviour carries the complete identity claim.

This broader organization is organism-relative because the event changes the living system that undergoes it. The disturbance is not processed in a detached apparatus whose own condition is irrelevant. It alters the organism's physical state, regulatory activity, energetic demands, available responses, and future possibilities. A flytrap that has retained stimulation or entered closure is in a different condition from one that has remained open. A human undergoing pain, fear, colour perception, bodily disequilibrium, or recursive thought may likewise be altered across different combinations of sensory, neural, metabolic, autonomic, mnemonic, and behavioural dimensions [12, 13, 21–24, 27, 29, 69, 79].

Organism-relative does not imply the presence of a separate observer inside the organism. It means that the transition is structured by the maintained condition, history, constraints, vulnerabilities, and possibilities of the living system itself. The organism is both the physical site of the event and the system whose future organization is changed by it.

This relation cannot be captured by anatomy alone. Anatomy identifies structures. Physiology identifies many of their operations. The organism-relative analysis asks how those operations form a bounded event that matters to the continued organization of the living system.

The comparative method therefore places a reciprocal burden on both sides of the argument. The flytrap need not prove plant phenomenology in order to be theoretically important. It need only demonstrate that relations sometimes treated as inherently neural—such as finite persistence, state-dependent integration, threshold commitment, coordinated transformation, and active restoration—can occur in another living substrate [65, 66, 77, 79, 80, 84–86]. Once that is shown, those relations cannot be defined as neural merely because their most differentiated known implementations are found in nervous systems.

A neural theory may still establish that additional organization is necessary for phenomenology, differentiated content, recursive ownership, or report. It must identify that organization explicitly rather than treating neural anatomy itself as the explanation.

The converse restriction is equally important. The framework cannot infer phenomenology merely because a non-neural organism exhibits selected relational features. It must explain why the proposed complete organization is sufficient, how it differs from simple reactivity, and what evidence would count against the identity proposition. Comparative biology therefore constrains both unexplained neural exclusivity and indiscriminate inclusion.

Its value lies in separating what may be fundamental from what is elaborative. It asks which relations belong to the minimal bounded event and which arise only with increasing differentiation, temporal depth, memory, learning, recurrence, representation, and recursive self-reference. The explanatory question is no longer simply which tissue possesses consciousness. It becomes: which organized biological relations are necessary for an organism-relative event, and how are those relations transformed across living systems?

This approach allows anatomy to remain causally indispensable without turning one anatomy into an unexplained boundary. It permits functional comparison without detaching function from material implementation. It permits continuity without erasing discontinuity, and it makes the identity proposition answerable to graded biological evidence rather than resemblance or intuition.

The first shared requirement is also the most physically basic. Neither the flytrap nor the human organism can register, retain, integrate, commit, or recover unless it continually maintains the electrochemical, metabolic, and regulatory conditions—and the substrate-specific mechanical, hydraulic, vascular, or other physiological support—that make those operations possible. The comparative analysis therefore begins with the nonequilibrium requirements of living organization.

5.2 Shared Nonequilibrium Requirements

The organizational relations identified in the Venus flytrap and the human organism depend upon a more fundamental physical condition: neither system can remain responsive, preserve the consequences of disturbance, undergo coordinated transformation, or recover if the living system is allowed to reach thermodynamic equilibrium. Living systems must continually maintain structured differences that would otherwise decay through diffusion, membrane leakage, chemical degradation, molecular turnover, thermal fluctuation, and mechanical disturbance [32].

These maintained differences include unequal ion concentrations across membranes, electrical potentials, calcium gradients between cellular compartments, selective distributions of water and solutes, metabolic availability, and the functional organization of proteins, membranes, transport systems, and regulatory pathways [32, 78, 82, 90]. Their apparent stability is dynamically produced. A resting membrane potential is not a state of physical inactivity, and an excitable trap awaiting stimulation is not an inert structure. In both cases, energy-dependent processes preserve the conditions under which a later disturbance can become biologically consequential.

Nonequilibrium therefore refers not to uncontrolled instability but to actively maintained organization. Many physiological variables remain within relatively narrow operating ranges, yet they do so only because matter and energy are continually exchanged and regulatory work continually opposes equilibration [24, 32]. Biological readiness is thus already an achievement of the living system. It is not a neutral baseline placed outside the event.

Electrical excitability makes this dependence especially clear. An electrical signal can occur only because ions have already been distributed unequally across a selectively permeable membrane. When channels open, ions move through gradients established by prior work, altering membrane potential and recruiting further cellular processes [78, 90]. The initiating disturbance does not create the energetic and electrochemical capacity required for signalling; it releases or redirects a capacity that the organism has already maintained.

Signalling also disturbs the conditions upon which later signalling depends. Ions move, membrane voltage changes, and intracellular calcium may rise. If the system is to remain excitable, these changes must be contained and the relevant gradients restored [77, 78, 90]. The general relation therefore includes prior maintenance, controlled disturbance, propagation of biological consequence, and energy-dependent recovery. Plant and animal excitability share this physical requirement even though their dominant ions, channels, transporters, cellular structures, propagation speeds, and wider architectures differ substantially.

In the Venus flytrap, calcium-permeable channels, anion channels, potassium channels, proton pumps, and associated transport systems contribute to different phases of the developing electrical event and its resolution. AHA-type proton pumps contribute to

the hyperpolarization and recovery phase, while the trigger-hair-associated KDM1 potassium channel contributes to re-establishing potassium conditions and recovering mechanosensory excitability [77, 78]. Mechanical stimulation therefore recruits pre-existing electrochemical gradients and transport systems that support depolarization, calcium-related change, propagation, repolarization, hyperpolarization, and restoration.

Animal neurons implement excitability through different molecular arrangements. Sodium, potassium, calcium, and chloride gradients are regulated through animal channels, exchangers, transporters, buffering systems, and ATP-dependent pumps. These gradients support action potentials, synaptic transmission, transmitter release, intracellular signalling, and recovery [33–35, 90, 91]. A plant proton pump is not an animal sodium–potassium pump, and a flytrap action potential is not equivalent to a cortical spike. The shared requirement lies at a more general physical level: an excitable system must actively establish gradients, permit their controlled use, and restore sufficient organization for continued responsiveness.

Calcium signalling exhibits the same structure. A transient rise in cytosolic calcium is biologically effective partly because resting concentrations are kept low relative to extracellular space and intracellular stores. Channel opening or release from stores changes that distribution, while buffering, sequestration, exchange, and extrusion limit the change and eventually restore the prior separation [82, 91, 94]. Without the maintained gradient, calcium movement would not carry the same signalling significance. Without later removal or sequestration, the signal would not remain temporally bounded.

The functional use of calcium differs markedly across organisms and tissues. In the flytrap, calcium-related dynamics can outlast the fastest electrical component and contribute to the interval across which successive disturbances interact. In nervous systems, calcium participates in transmitter release, excitability, plasticity, gene regulation, and many other processes [82, 91, 94]. The comparison does not equate these functions. It identifies their shared dependence upon actively maintained concentration differences whose temporary alteration becomes biologically consequential.

Mechanical preparation and the wider hydraulic condition of the trap likewise depend upon prior nonequilibrium organization. The open flytrap is not a passive container that acquires mechanical capacity only after stimulation. Its geometry, tissue stress, osmotic condition, water distribution, and hydraulic organization contribute to a prepared physiological and mechanical state. Recent in-situ hydraulic and mechanical measurements indicate, however, that the rapid closure itself is too fast to be driven by water transport. Instead, rapid softening of the epidermal cell wall releases elastic energy stored in the trap, allowing the mechanically prepared structure to undergo the snap-through transition [84, 85]. Water and turgor relations remain relevant to the broader physiological condition and preparation of the trap, but they should not be identified as the immediate motor of the fast snap. The visible movement therefore recruits a mechanically and physiologically prepared structure whose relevant conditions existed before the trigger hair was displaced.

Human movement relies upon different structures but the same broad requirement. Muscle contraction depends upon pre-existing ionic gradients, calcium regulation, ATP availability, connective organization, and tissue tension. Vascular and autonomic processes maintain pressure, oxygen delivery, temperature, and fluid distribution before any particular action is initiated [24, 92]. In both organisms, coordinated transformation draws upon differences that have already been produced and preserved.

This maintenance occurs across interacting scales. At the cellular level, organisms regulate membrane potential, pH, calcium concentration, redox state, molecular turnover, and metabolic availability. At the tissue level, they preserve extracellular conditions, coordinated excitability, mechanical readiness, resource supply, and removal of metabolic products [24, 32–35, 42, 82, 90–92]. At the organismal level, the relevant requirements vary by substrate and may include resource acquisition, gas exchange, fluid balance, temperature regulation, endocrine control, autonomic organization, hydraulic regulation, and competition among biological demands. These organism-level conditions constrain what events can presently occur.

The Venus flytrap and the human organism coordinate these scales very differently. The flytrap capture event is concentrated within a specialized leaf structure whose electrical, hydraulic, mechanical, metabolic, and digestive functions are organized around prey capture. Human events may recruit distributed neural, glial, vascular, autonomic, endocrine, musculoskeletal, and metabolic systems [24, 33–35, 42, 65, 79, 81, 92]. Even an apparently localized percept can depend upon conditions extending far beyond the initially stimulated tissue.

The shared principle is that no bounded organism-relative transition occurs independently of the maintained state of the living system. A disturbance enters an organism with a particular energetic capacity, recent history, degree of restoration, and regulatory condition. The resulting event therefore depends not only upon the external input but upon what the organism can presently sustain.

A weakened gradient, impaired ATP production, altered channel function, disrupted calcium regulation, insufficient hydration or vascular supply, temperature change, or incomplete recovery from prior activity can alter the consequences of the same nominal stimulus [24, 38–40, 50, 53–55, 80, 81, 83, 90, 91]. The external disturbance may remain similar while the biological event changes because the maintained system into which it enters is no longer the same.

This provides the physical basis of organism-state dependence. A healthy mature flytrap can transform trigger-hair displacement into a rapidly propagating electrical and calcium event, whereas an immature or chemically disrupted trap may fail to propagate the signal or close effectively. In humans, local sensory responses may remain while wider integration, coordinated action, or report is impaired when excitability, metabolic support, connectivity, or systemic regulation is sufficiently disrupted [30, 31, 38–40, 50, 53–55, 60, 64, 73, 75, 77, 80, 81]. The specific failure patterns differ, but both systems depend upon preservation of the physical conditions supporting their functions.

Nonequilibrium maintenance also contributes to the temporal boundaries of the event. If every physiological alteration disappeared immediately, an earlier disturbance could not influence a later one. If all changes persisted indefinitely, distinct events could not be effectively bounded. Biological systems must therefore preserve selected consequences while allowing others to decay, be reversed, or be incorporated into a changed baseline.

Persistence and restoration are not opposing principles. They are coordinated features of the same organization. In the flytrap, the first stimulation leaves a physiological consequence capable of interacting with a second even while repolarization and other restorative processes are already underway [66–78]. Different variables recover at different rates. The finite integration window reflects the persistence and decay of this retained biological state, with calcium dynamics providing a directly measured contributor and empirical indicator rather than necessarily its sole physical basis.

Human events involve many overlapping timescales rather than one fixed hierarchy of recovery. Membrane, intracellular, synaptic, network, autonomic, endocrine, metabolic, and structural processes can persist and resolve across partially overlapping intervals ranging from milliseconds and seconds to minutes, hours, days, or longer, depending upon the process and event [9, 10, 12, 13, 24, 33–35, 42, 68, 69, 74, 90, 91, 94]. An event can therefore leave nested consequences without remaining continuously active as one undifferentiated process. Greater organizational differentiation expands the number of ways in which biological history can remain operative.

The nonequilibrium requirement must not be reduced to the observation that energy is consumed. Energy expenditure is necessary to maintain and reorganize the relevant physical differences, but magnitude alone does not identify the event. Large amounts of energy can be dissipated in processes that do not exhibit the proposed organization, including growth, repair, secretion, detoxification, and muscular work [32–35, 42, 92]. Conversely, a comparatively small energetic change may become highly consequential when it occurs within a selectively organized system near a transition threshold.

The relevant question is therefore not simply how much energy is used, but what organization that expenditure maintains, permits to change, coordinates, and restores. The flytrap requires far less absolute energy than the human nervous system, yet this difference does not determine whether the systems share a physical requirement [33–35, 42, 79]. Their commonality lies in metabolically supported maintenance and restoration of nonequilibrium organization that preserves readiness, supports selective signalling, sustains coordinated transformation, and recovers functional availability.

Nonequilibrium maintenance is consequently necessary but not sufficient for the organism-relative identity proposition. It is necessary because the bounded event cannot occur without maintained gradients, regulatory organization, and restorative capacity. It is insufficient because the same general requirements support many living processes that are not, by that fact alone, complete mapped events [32–35, 42]. The framework therefore does not identify metabolism in general with phenomenology, nor does it predict that phenomenal intensity varies directly with total energy consumption.

Ordinary maintenance and event-specific recruitment must also be distinguished. Before a particular disturbance occurs, the organism sustains a background condition of readiness. During the event, selected components of that maintained capacity are recruited, redistributed, or temporarily disrupted. As the event develops, restoration begins and eventually returns the organism to continued maintenance, often in an altered condition.

The bounded transition therefore occurs within the organism's ongoing self-maintenance without being identical to it. Continuous maintenance supplies the capacity for events; a particular disturbance organizes part of that capacity into a temporally structured transition with identifiable consequences and resolution. This prevents both the fiction of a physically inactive baseline and the opposite error of treating all living activity as one uninterrupted organism-relative event.

The shared foundation can therefore be stated narrowly. A bounded organism-relative state-transition requires a living nonequilibrium system capable of preserving relevant distinctions, recruiting those distinctions into coordinated change, and restoring sufficient organization for continued biological availability. This condition establishes the physical possibility of the Grind. It does not, by itself, establish the Glow.

With that requirement in place, the comparison can turn from the maintained capacity of living systems to the event structure built upon it: registration, persistence, integration, commitment, transformation, resolution, and renewed availability.

5.3 Shared Event Structure

The shared nonequilibrium requirements established in the preceding subsection explain how biological responsiveness remains physically possible. They do not yet specify the organization of the event that emerges from that maintained capacity. The next task is therefore to compare the Venus flytrap and the human organism at the level of the complete bounded transition.

The comparison does not imply identical mechanisms, equivalent capacities, or common phenomenal content. It asks whether a recurring set of causal relations can be identified across substantially different living substrates. Those relations include maintained readiness, selective registration, propagation beyond the initial site of disturbance, persistence of biological consequence, integration with retained history and present organismic condition, organism-relative valuation, transition into coordinated commitment, wider state transformation, energetic and regulatory consequence, resolution, and renewed functional availability.

These relations should not be interpreted as discrete stages that occur in a rigid sequence. Living events develop through overlapping processes. Restoration may begin while signalling remains active. Valuation is expressed through the way registration and integration are constrained by the organism's condition. Mechanical, metabolic, autonomic, attentional, and

behavioural changes may begin before every aspect of the developing event has stabilized. The sequence identifies analytically distinguishable functions within an integrated transition, not isolated temporal compartments.

Table 5.1. Shared Relations Within the Bounded Organism-Relative Event

Organizational relation	Venus flytrap implementation	Human implementation / representative examples	Shared relation and limit
Maintained readiness	An open and mechanically prepared trap sustained by membrane potentials, ion gradients, calcium regulation, hydraulic organization, tissue geometry, metabolism, and trigger-hair sensitivity [77–79, 84–86]	Maintained receptor sensitivity, neural excitability, synaptic availability, metabolic and vascular support, autonomic regulation, and bodily readiness [23, 24, 33–35, 42, 64, 90–92]	Energy-dependent preservation of the conditions through which a disturbance can become consequential. Readiness alone is not the complete event.
Selective registration	Qualifying trigger-hair displacement produces receptor activity and initiates electrical and calcium-related signalling [76, 80]	Sensory and interoceptive receptors transduce light, sound, pressure, temperature, chemicals, tissue disturbance, and internal bodily change [23, 27, 29, 95]	A disturbance is selectively converted into a differentiated biological alteration. Similarity of transduction does not imply similarity of content.
Propagation	Electrical and calcium-related consequences extend beyond the stimulated trigger-hair region and recruit the wider trap [77, 80]	Neural, glial, vascular, autonomic, endocrine, and bodily pathways distribute the consequences of sensory and internal change [23, 24, 64, 95]	A local disturbance becomes available to a wider biological organization. Plant propagation is not equivalent to human thalamocortical or representational processing.
Persistence	The first stimulation leaves a finite physiological consequence capable of affecting the response to a later stimulation [66, 77]	Recurrent activity, synaptic condition, intracellular signalling, working memory, bodily regulation, and longer-term memory preserve consequences across multiple timescales [5–10, 68, 94, 96, 97, 99]	A prior event remains physically capable of altering later processing. Flytrap persistence is not recollection or autobiographical memory.
Integration and state dependence	A subsequent stimulation interacts with the retained consequence of the first, while maturity, excitability, temperature, hydration and mechanical condition, and prior activity can constrain the result [66, 77, 80, 81, 83–86]	Present input may be integrated with ongoing neural activity, interoception, attention, memory, affect, expectation, learning, context, and action readiness [9, 10, 23, 24, 68, 69, 95, 97, 99]	Present disturbance is processed in relation to retained history and current organismic condition. Human integration is vastly more differentiated and recurrent.
Organism-relative differential organization (biological valuation)	Subthreshold or insufficient excitation can decay without closure; sufficient excitation history recruits rapid closure, while continued prey-like stimulation can recruit later jasmonate signalling, tighter sealing, gland activation, digestion, and nutrient uptake [65, 66, 79, 81, 87–89]	Disturbances may be differentially organized according to bodily need, threat, opportunity, learned significance, social meaning, and possible action [12, 13, 21–24, 27, 56, 57, 69, 100, 101]	Differential biological response relative to the organism's maintained condition and possibilities is empirically observable. Its characterization as biological valuation is the framework's theoretical mapping and does not imply reflective judgment.
Commitment	Sufficient electrical excitation history precedes rapid closure, with calcium dynamics providing a directly measured component of the integration process; rapid epidermal cell-wall softening then releases stored elastic energy and permits snap-through, while continued stimulation can recruit tighter sealing and digestion [65, 66, 84, 85]	Distributed transition conditions may alter perception, attention, autonomic regulation, motor preparation, memory encoding, decision processes, and report [24, 68, 95, 97]	Accumulated biological conditions reorganize the system's available responses. Human commitment is not reducible to one threshold or one behavioural output.
Coordinated transformation	Rapid epidermal cell-wall softening releases stored elastic energy and drives the snap-through change in lobe geometry; across the developing capture sequence, electrical and calcium conditions, respiration, photosynthetic activity, jasmonate signalling, gland activity, digestive state, and future trap availability are also altered [65, 79, 81, 84–86]	Neural, vascular, autonomic, endocrine, muscular, affective, attentional, and behavioural conditions may change across the developing event [12, 21, 24, 33–35, 42, 68, 92, 95]	The event alters the wider state and future possibilities of the organism. The timing, scale, differentiation, and flexibility of the transformation differ profoundly across substrates.
Energetic and regulatory consequence	Electrical signalling, closure, continued stimulation, sealing, digestion, ion restoration, and reopening recruit measurable biological work [32, 65, 78, 79, 81, 86]	Neural signalling, synaptic activity, vascular support, ion pumping, autonomic regulation, muscular preparation, and recovery recruit metabolic and regulatory work [12, 16, 21, 24, 33–35, 42, 92]	The event depends upon energy-dependent maintenance, recruitment, and restoration. Energy expenditure is necessary but not sufficient.

Resolution and renewed availability	Electrical, ionic, calcium-related, metabolic, hydraulic, and mechanical conditions are restored or reorganized until the trap regains capture capacity [77–80, 86]	Neural excitability, metabolic balance, autonomic condition, attention, bodily regulation, and behavioural readiness move toward functional stabilization [24, 33–35, 40, 42, 75, 90–92]	Disturbed variables are contained, restored, or incorporated into a new state that permits further events. Functional restoration is not exact reversal of the preceding condition.

The table does not depict two versions of one mechanism. It identifies a recurring event organization. A maintained living system is disturbed; the disturbance is selectively registered; its effects extend beyond the initial site; some consequence persists; present input interacts with retained history and current organismic condition; the disturbance acquires differential significance for the organism; a transition reorganizes available responses; the organism enters an altered condition; and regulatory work eventually restores sufficient availability for subsequent events.

This organization is more informative than a list of shared molecules. Plant and animal systems both use membranes, ion channels, calcium, water, proteins, ATP, and electrochemical gradients, but those components also participate in countless unrelated processes [32, 77, 78, 82, 90, 91]. Their presence alone does not establish a shared organism-relative event. The stronger comparison concerns how they are recruited into a bounded and consequential transformation.

The event structure also reveals the limitations of a simple stimulus-response description. An input-output model records the initiating disturbance and the final behaviour but omits the actively maintained condition upon which the disturbance acts. It omits the biological consequences of preceding events, the current state of the organism, the processes that constrain commitment, the work required to sustain transformation, and the restoration through which future responsiveness is preserved. It can therefore make different internal organizations appear equivalent whenever they produce a similar visible output.

The more complete unit includes the organism's prior readiness, the disturbance, the retained consequences of recent history, the present regulatory condition, the developing transformation, and its resolution. These are not independent variables that combine linearly. They are mutually constraining aspects of one event. Their importance lies in preserving what a simple stimulus-response account removes.

The flytrap makes this broader organization unusually visible. Before stimulation, the trap is already maintained in an electrically, physiologically, and mechanically prepared condition. Qualifying trigger-hair displacement produces electrical and calcium-related changes. The first disturbance alters the state encountered by the second. When the developing excitation history becomes sufficient for closure, rapid softening of the epidermal cell walls releases elastic energy stored in the mechanically primed trap, permitting the snap-through transition and rapid change in lobe geometry. Continued stimulation can recruit tighter sealing and digestion. Across the developing event, ion distributions, tissue geometry, respiration, photosynthetic activity, hormonal signalling, resource allocation, and future availability are altered. The system must subsequently restore or reorganize the relevant conditions before another capture event becomes possible [65, 66, 76–81, 84–89].

Human organism-relative events contain the same general relations but embed them within a far more differentiated and recurrent architecture. A painful disturbance, for example, may produce receptor activity while attention is redirected, autonomic regulation changes, muscles prepare for withdrawal, affective systems alter the significance of the event, memories are recruited, and verbal or behavioural responses begin to form [12, 21, 23, 24, 27, 28, 68, 95]. Some of these processes belong to the primary organism-relative event. Others belong to later interpretation, ownership, and report. Their interaction can modify the event before it has fully resolved.

Greater complexity therefore does not replace the bounded event structure. It multiplies the number of processes participating within it, expands the temporal range over which prior states remain consequential, and permits recurrent interaction among sensory, interoceptive, mnemonic, affective, attentional, motor, social, linguistic, and self-referential systems [23, 68–72, 95–100].

This distinction prevents the flytrap from being portrayed as a miniature human. The plant presents a comparatively restricted capture architecture organized around a narrow class of mechanically relevant disturbances and a limited range of outcomes. Human organisms sustain many overlapping event organizations. They can register multiple external and internal modalities, preserve history through different forms of memory, compare competing possibilities, modify valuation through learning and symbolic meaning, and repeatedly reinterpret an event as it develops [9, 10, 68–71, 95–101].

The shared structure is therefore best understood as a scaffold. In a comparatively restricted system, the scaffold may support a narrow class of disturbances, short-lived persistence, limited possible transitions, and relatively stereotyped outcomes. In a highly differentiated system, it may support multiple modalities, parallel and recurrent integration, longer retained history, learned and symbolic significance, competing actions, counterfactual projection, and recursive reinterpretation.

The scaffold does not determine phenomenal content by itself. It specifies the relations through which biologically differentiated content can be organized relative to a living system.

Both organisms register disturbances, but they do not register the same properties or resolve them into the same distinctions. The flytrap capture mechanism is selectively organized around forms of mechanical stimulation relevant to prey capture. Human sensory and interoceptive systems differentiate a vastly wider range of external and internal variables [23, 27, 29, 95].

Both organisms preserve consequences of prior events, but they do not possess equivalent memory. The flytrap retains a comparatively brief physiological alteration capable of modifying the effect of subsequent stimulation. Humans preserve history

through interacting forms of sensory, procedural, emotional, semantic, episodic, autobiographical, and bodily retention [5–10, 94, 96, 97, 99, 101].

Both organisms undergo threshold-dependent transitions, but they do not make the same kind of commitment. The flytrap enters a restricted capture response. Human transitions may incorporate uncertain evidence, competing goals, social meaning, learned rules, anticipated consequences, and imagined futures [68, 98, 100].

Both organisms restore functional availability, but the scale and organization of recovery differ. Flytrap restoration concerns electrical, calcium-related, hydraulic, mechanical, metabolic, and capture-related readiness. Human recovery may involve neural excitability, effective network coordination, vascular support, autonomic balance, endocrine regulation, attention, memory access, motor capacity, and behavioural availability [24, 33–35, 38–40, 42, 75, 90–92].

Every shared relation is therefore accompanied by a difference in implementation, differentiation, temporal depth, and available consequence. Continuity does not imply equivalence, but difference does not eliminate the possibility of shared organization.

The recurring structure can be grouped into four broad functional layers. First, physical readiness preserves the gradients, resources, and structural conditions required for responsiveness. Second, event formation converts a disturbance into a propagated and persistent biological alteration that interacts with the current condition of the organism. Third, organism-relative transformation differentiates the consequence of that alteration, constrains commitment, and reorganizes the system's available states. Fourth, resolution contains or incorporates the disturbance and restores sufficient capacity for future events.

These layers overlap. Restoration begins during transformation, and the organism's state influences registration from the outset. The layered description therefore identifies functional relations rather than temporal compartments.

Human systems add extensive recurrence among these relations [64, 68, 95, 97, 99]. A developing transformation can modify what is subsequently registered. Memory can alter valuation. Valuation can redirect attention. Attention can amplify or attenuate integration. Autonomic and metabolic changes can influence later perception. Interpretation can prolong biological recruitment after the initiating disturbance is no longer present.

Recurrence, however, must remain distinct from recursive narration. Recurrence is a general causal relation in which the consequences of one process alter subsequent processing. Recursive narration is a more specialized organization involving memory retrieval, comparison, attribution, projection, self-reference, and possible report. The flytrap exhibits feedback and stage-dependent modification, but it does not provide evidence of the human narrator or of an event being recursively organized around a virtual self [65, 66, 69, 72, 81].

Within the present architecture, the shared candidate event structure corresponds primarily to operations assigned to L1. Selective registration, persistence, integration, organism-relative differential organization, commitment, and coordinated transformation can occur before explicit recognition or ownership. This architectural correspondence does not by itself establish that the flytrap possesses phenomenology. L2 emerges when retained history and current processing become recursively organized through memory-dependent conscious thought, interpretation, attribution, virtual self-reference, and related operations occurring through psychological time. The narrator elaborates and can feed back into the primary architecture; it is not the source from which that architecture begins.

This distinction is essential to the comparative argument. If phenomenology were identified only with human report or self-recognition, the theory would have defined the primary event through its later narrative reconstruction. Conversely, identifying phenomenology with one action potential, one threshold, one molecule, or one energetic expenditure would reduce the event to a component that is neither organismically complete nor sufficiently specific.

The proposed mapped unit must remain the complete bounded organism-relative event. Electrical, chemical, metabolic, mechanical, neural, autonomic, and behavioural measurements reveal components or consequences of that event. Visible output is one possible result. Energetic expenditure supports its implementation and restoration. None of these isolated observations substitutes for the event as an integrated whole.

The relations identified in the table should therefore not be treated as independent generators of separate fragments of phenomenology. Registration without persistence may remain a transient local alteration. Persistence without integration may leave a trace that fails to modify later organization. Integration without organism-relative consequence may amount only to formal signal combination. Commitment without restoration may exhaust or terminate future availability. The candidate event depends upon their coordinated organization within the maintained living system.

This gives the framework a more restrictive comparative target than responsiveness alone. A system should not be included merely because it detects a stimulus, retains a state, crosses a threshold, or consumes energy. The relevant question is whether these capacities form a bounded living transition whose development depends upon the system's maintained condition, whose consequences alter its biological possibilities, and whose resolution preserves or reorganizes future availability.

The same restriction applies to nonliving analogues. A thermostat crosses a threshold, a latch retains a state, a computer combines inputs, a chemical network may exhibit history dependence, and a motor consumes energy. These partial similarities do not make the boundary arbitrary. They show why no single formal property is sufficient. The proposed unit concerns the coordinated relation among living nonequilibrium maintenance, organism-relative consequence, state transformation, and active biological resolution.

Whether this complete organization is sufficient for a minimal inside view remains the central theoretical question. The comparative evidence does not settle that proposition merely by displaying shared relations. Its contribution is to define the

candidate event more precisely, show that its components can be investigated across different living substrates, and identify where further constraints may be required.

The scaffold may prove too broad. Some relations may be necessary without being sufficient. Additional neural, dynamical, or integrative organization may prove indispensable. The proper event boundary may require revision. These possibilities cannot be excluded by definition. The comparative structure is therefore not a declaration of equivalence but a research framework through which the proposed relations can be separated, perturbed, and tested.

A cautious statement of the shared event structure can now be given. A living system capable of a bounded organism-relative transition must maintain readiness, selectively register consequential change, preserve enough history for present input to become state-dependent, integrate that input with its current condition, differentially organize the developing response according to its biological consequences for that organism, undergo coordinated transformation, and resolve its consequences sufficiently to preserve continuing biological availability.

The Venus flytrap provides a compact implementation of this organization. The human organism provides a highly differentiated, recurrent, and recursively elaborated implementation. The shared scaffold establishes continuity; the differences determine the scale, flexibility, temporal depth, differentiation, ownership, and reportability of the resulting events. Those discontinuities must now be examined with the same precision as the common structure.

5.4 Important Discontinuities

The presence of shared organizational relations does not imply that the Venus flytrap and the human organism instantiate equivalent events. Continuity is not sameness. A scientifically useful comparative account must identify discontinuities as clearly as common structure; otherwise, the difference between a specialized plant capture sequence and the differentiated organization of human phenomenology would be reduced to an unspecified increase in "complexity."

The human organism does not merely perform a greater quantity of the same operations. Neural, bodily, mnemonic, affective, behavioural, social, linguistic, and recursive systems introduce forms of organization for which the flytrap provides no comparable evidence. These additions alter what can be registered, how many variables can be integrated, how long biological history can remain operative, how flexibly the organism can respond, how absent possibilities can affect present processing, and how generated virtual self-reference can become involved in later events.

These capacities should not be treated as one indivisible package. They depend upon distinguishable biological organizations and can dissociate under development, injury, disease, sleep, anaesthesia, and altered states [31, 36–40, 45–50, 53–55, 59, 60, 73–75]. Some increase the differentiation and temporal depth of primary organism-relative processing. Others support recursive interpretation, ownership, symbolic expression, and report. Many contribute to feedback between the two levels. The comparative task is therefore to specify what these additions contribute without assuming either that they create organism-relative processing from nothing or that their absence is inconsequential.

The first major discontinuity concerns sensory differentiation. The flytrap capture organ is selectively organized around a narrow biological problem. Mechanical disturbances at its trigger hairs are processed in relation to closure, prey retention, sealing, digestion, and later reopening. The plant event is therefore differentiated, but within a highly specialized domain.

Human sensory and interoceptive systems distinguish a much wider range of external and bodily variables [23, 27, 29, 95]. Vision, audition, touch, temperature, tissue damage, chemical composition, proprioception, vestibular state, visceral condition, and other modalities depend upon different receptors, pathways, and forms of integration. These systems do not merely increase the number of inputs. They permit biologically distinct forms of content to be differentiated within the organism.

The shared presence of registration therefore provides no basis for projecting human colour, sound, pain, imagery, or affective experience into the flytrap. Those forms of differentiation depend upon biological organizations that have not been demonstrated in the plant. The continuity claim concerns the general structure through which consequential change is registered, not the unrestricted transfer of phenomenal content across organisms.

A related discontinuity concerns the scale and differentiation of integration. The flytrap event extends beyond the stimulated trigger hair. Electrical and calcium-related changes propagate through the trap and become coupled to the mechanically prepared closure system and to broader metabolic, hormonal, digestive, ionic, and water-regulatory processes across the developing capture sequence [65, 77–81, 84–86]. Its capture sequence is therefore distributed rather than confined to one receptor.

Human organism-relative events can recruit a substantially larger and more differentiated architecture. Sensory pathways, subcortical and cortical systems, bodily regulation, vascular and metabolic support, autonomic activity, memory, attention, affect, and action preparation can remain mutually influential within one developing event [23, 24, 64, 68, 69, 95–97]. The important difference is not physical size alone, but the number and diversity of processes that can be coordinated while continuing to modify one another.

A visual disturbance may redirect attention; attention may alter sensory processing; memory may change interpretation; bodily arousal may modify valuation; valuation may redirect action; and action preparation may feed back into subsequent perception [12, 21, 23, 68–71, 95, 99, 100]. Human events can therefore integrate variables originating in different systems, operating across different timescales, and bearing different relations to the organism's history. The flytrap capture sequence is coordinated, but the available evidence does not support an equivalent multimodal integration architecture.

The extent and depth of recurrence constitute another important discontinuity. The flytrap does not operate as a strictly linear chain. Earlier stimulation changes later responsiveness, continued prey movement produces further signals, and later stages of capture depend upon conditions established during earlier stages [65, 66, 81]. This is recurrence in a general causal sense: the consequence of one process alters subsequent processing.

Human nervous systems support extensive recurrent and re-entrant interaction among sensory, attentional, affective, mnemonic, interoceptive, associative, and motor systems [64, 68, 95, 97, 99]. Processing does not proceed only from receptor to response. Later activity can modify earlier activity; attention can amplify or suppress selected input; memory can change the significance of a present event; bodily condition can reshape perception; and a developing response can be revised repeatedly before overt behaviour occurs.

Recurrence must nevertheless be distinguished from recursive narration. Biological feedback is widespread and does not by itself imply a narrator. Recursive narration requires a more specific memory-dependent organization in which retained history and present processing are repeatedly recruited through operations such as recognition, comparison, interpretation, judgment, attribution, ownership, and virtual self-reference. Explicit projection toward absent or possible events can occur within this organization but is not required for every recursive thought. The flytrap demonstrates limited recurrence and historical dependence. It does not provide evidence of this self-referential architecture.

The difference is equally visible in memory. The flytrap preserves a consequence of prior stimulation across a finite interval, allowing later input to act upon an altered physiological state [66, 77]. This is a legitimate form of biological retention. It is not equivalent to the range of memory processes available to humans.

Human organisms preserve consequences through multiple mechanisms and over multiple timescales. Short-lived sensory persistence, working memory, procedural learning, emotional conditioning, semantic knowledge, episodic reconstruction, and autobiographical continuity differ in mechanism, duration, accessibility, and relation to virtual autobiographical self-reference [5–10, 94, 96, 97, 99, 101]. Retained history can therefore be reactivated long after the original physiological transition has ended.

A remembered injury can alter the valuation of a present disturbance. A familiar object can be recognized through stored perceptual organization. A learned word can recruit absent objects and prior contexts [5–10, 27, 69–71, 99, 101, 102]. An autobiographical event can be reconstructed as something that happened to “me.” The discontinuity is therefore not merely one of shorter versus longer retention. It is the difference between a retained physiological consequence and reconstructive access to a relational history that can be made biologically active again in the present.

Learning further enlarges this difference. The flytrap capture architecture is highly specialized, and its principal trigger conditions and response stages are constrained by its evolved biological organization. This does not imply that plants lack physiological adjustment, plasticity, or history-dependent modification. It means that the evidence considered here does not establish the open-ended learning and flexible reorganization characteristic of human cognition.

Humans can acquire new perceptual categories, motor skills, symbolic relations, social expectations, fears, strategies, and interpretations [70, 71, 96, 97, 99–102]. Learning can alter what is detected, ignored, approached, avoided, or treated as possible. A previously neutral stimulus can acquire intense biological significance, while a previously threatening one can become tolerable through changed experience [101]. The organization of later events is therefore not only state-dependent but historically reconfigurable.

This flexibility substantially expands the forms of organism-relative evaluation available in humans. In the flytrap, stimulation is differentially organized according to its relation to the capture sequence. Insufficient excitation can decay without closure, sufficient excitation history can recruit closure, and continued prey-like stimulation can recruit sealing and digestion [65, 66, 79, 81]. The differential biological organization is empirically observable. Its characterization within this framework as primary biological valuation is a theoretical mapping and does not imply conscious judgment or reflective evaluation by the plant.

Human valuation can incorporate immediate bodily consequence, learned reward and punishment, attachment, social position, moral rules, symbolic meaning, remembered injury, future plans, and autobiographical identity. These dimensions can conflict. Immediate pain may be accepted for anticipated benefit. Hunger may be overridden by learned belief or social context. A physically harmless remark may produce marked autonomic and emotional consequences because of its meaning for identity. Present biological value can therefore be reorganized by memory, symbols, social relations, and projected futures [9, 10, 12, 13, 21, 69, 70, 98, 100, 101].

The possibility of conflict also changes the structure of commitment. The flytrap has a restricted range of capture-related transitions. Once sufficient conditions are reached, subsequent possibilities become strongly constrained by the closure, sealing, digestive, or reopening sequence [65, 81, 86].

Human organisms possess a much larger action space. A disturbance may produce orientation, withdrawal, approach, inhibition, speech, planning, social communication, delayed action, or no overt response despite continued internal processing. Several possible responses can be prepared at once; one may be inhibited while another is selected; action can be postponed while additional information is gathered; and commitment may depend upon a rule or anticipated consequence rather than immediate stimulation [68, 97, 98]. Crossing one threshold may therefore open a field of further decisions rather than determine a single fixed response.

One of the clearest discontinuities is the human capacity for counterfactual projection. Present biological organization can be altered by events that are not currently occurring. A person can anticipate danger, imagine reward, rehearse an alternative action,

reconstruct a possible loss, or consider how the past might have unfolded differently [9, 10, 98]. These absent possibilities can alter attention, respiration, autonomic activity, muscular readiness, affect, and behaviour [12, 13, 21, 22, 98].

Counterfactual projection requires more than persistence. Retained material must be reorganized into a possible event that has not occurred or is not presently occurring. The flytrap's current response is conditioned by earlier stimulation and by its stage within the capture sequence, but there is no comparable evidence that it constructs absent scenarios and evaluates them before acting.

Counterfactual projection is one expression of a broader discontinuity: psychological time. All biological events unfold in physical time. The flytrap's electrical activity, calcium dynamics, closure, digestion, recovery, and reopening possess temporal structure [65, 66, 77, 79, 81, 86]. Physical temporality, however, is not equivalent to psychological time.

Within the present framework, psychological time is the temporal organization intrinsic to memory-dependent conscious thought. It is not limited to explicit recollection of the past or anticipation of the future, and it does not require self-reference. Even an apparently present-tense thought recruits retained history through recognition, comparison, categorization, interpretation, or learned meaning. Explicit remembering, anticipation, counterfactual simulation, and autobiographical projection are more elaborated operations occurring within this temporally organized cognitive domain. Conscious cognitive thought therefore operates through psychological time, whereas primary phenomenology need not.

This organization can extend an event far beyond the duration of its initiating disturbance. A brief social interaction may be revisited for hours. A remembered injury may repeatedly recruit threat-related processing. An imagined future may sustain autonomic and regulatory demand despite the absence of an immediate external danger [9, 10, 12, 13, 21, 22, 98]. The flytrap provides evidence of retained state and downstream consequence, but not of self-referential temporal reconstruction.

The most important discontinuity for the two-level architecture is the emergence of recursive ownership. Primary organism-relative processing does not require a separate observer. Registration, integration, valuation, and transformation occur within the living system before a narrated owner is introduced.

In humans, aspects of an event can later be retrieved and reorganized through recognition, comparison, judgment, attribution, and ownership [69, 72, 96, 99]. The event becomes something that "I saw," "I felt," or that "happened to me." The narrator is generated through this recursive organization rather than existing beforehand as an independent recipient of the event.

Once generated, the narrator becomes biologically consequential. A remembered fear can alter present registration. A self-judgment can change autonomic condition. An anticipated threat to identity can redirect attention and prolong regulatory demand [12, 13, 21, 69, 70, 100, 101]. L2 is therefore derivative without being causally inert: it feeds back into later L1 events and can change what the organism subsequently registers, how incoming conditions are differentially organized, and how those conditions are resolved.

Nothing in the flytrap evidence demonstrates a recursive autobiographical architecture that retrieves prior capture events, attributes them to an enduring virtual reference point, and reorganizes present processing through that attributed history. Its event can be organized relative to the state and possibilities of the plant without being demonstrably self-narrated. Organism-relativity must therefore remain distinct from explicit selfhood.

Language adds another major transformation. Symbols can refer to objects, actions, categories, relations, and events that are not currently present. They allow complex histories to be compressed, communicated, rehearsed, and organized through abstract rules [70, 71, 99, 102]. A word can produce an organism-relative response through learned meaning alone, while a diagnosis, social category, or explanatory narrative can alter bodily interpretation and autobiographical identity [70, 71, 99, 100, 102].

The flytrap uses biological signals, but those signals are not known to form an open-ended symbolic system capable of arbitrary reference, propositional combination, or communication about absent possibilities. The distinction between biological signalling and symbolic representation must therefore remain clear.

Report is a related but distinct capacity. Human report provides evidence about discrimination, confidence, memory, ownership, and perceived content [30, 64, 72–75]. It is not identical to primary phenomenology. Report may fail because of disrupted motor output, language, memory, attention, access, or the recursive organization required to translate an event into communicable form [30, 31, 64, 73–75, 102].

Reportability should therefore not be treated as the boundary of L1. It is an additional organizational achievement through which an event becomes available for classification, symbolic expression, ownership, and communication. This creates an unavoidable evidential asymmetry. Human biological measures can be compared with first-person report, whereas the flytrap provides only exterior physiological and behavioural evidence. Any inference concerning its inside view must consequently remain more restrained.

Human recursive organization is also embedded in social and cultural systems. Language, caregivers, institutions, group practices, and shared narratives influence what is noticed, remembered, feared, valued, and attributed to the self [100]. A person's biological response can be shaped by symbolic institutions and socially transmitted meanings that have no immediate sensory presence [100]. The flytrap interacts with its environment and with other organisms, but the present evidence does not support an equivalent socially transmitted narrative architecture.

These additions also complicate the boundaries of human events. The flytrap capture sequence possesses a comparatively clear biological arc: a mechanical disturbance is registered, retained, integrated, and resolved through closure, digestion, failed capture, or reopening. Human events can become nested across several levels and timescales. A brief sensory transition may produce an

affective consequence, become retained in memory, acquire autobiographical meaning, influence a later decision, and be recursively reopened long after the original stimulus has disappeared [5–10, 12, 13, 21, 69, 96–100].

A human account must therefore distinguish the initiating primary transition, its immediate organismic consequences, its retention, its later recruitment into L2, and its possible re-entry into subsequent L1 processing. These relations do not make human events intrinsically unbounded, but they increase the number of variables and timescales required to identify their functional limits.

Greater differentiation and recurrence also increase the potential biological support required by the event. More variables must be maintained, more distributed systems coordinated, more alternatives regulated, and more retained history made available. Recursive narration can repeatedly recruit the organism after the initiating disturbance has ended. The relevant discontinuity is not simply greater total energy consumption, which is affected by body size, tissue volume, temperature, and many unrelated functions [33–35, 42]. It concerns the organization of biological work across a more distributed, recurrent, and temporally extended process.

The relationship between the flytrap and the human organism therefore cannot be described as a minimal event to which an unspecified quantity of complexity has been added. New biological organizations create new relations. Retained history can become symbolically represented; symbols can recruit absent possibilities; possibilities can become organized around a virtual reference point; that generated reference can feed back into bodily and cognitive evaluation; and the resulting event can be reported, socially interpreted, and later reconstructed.

Nothing in the flytrap evidence demonstrates this recursively elaborated sequence, and the continuity claim does not require that it do so.

The strongest comparative position preserves two conclusions simultaneously. First, several relations implicated in bounded organism-relative transitions—including selective registration, finite persistence, state-dependent integration, organism-state-dependent differential biological organization, coordinated commitment, and active restoration—are not uniquely neural [65, 66, 76–81, 84–89]. Within the present framework, the differential biological organization is the relation termed primary biological valuation. Second, highly recurrent nervous systems support forms of sensory differentiation, memory, learning, flexible action, symbolic reference, counterfactual projection, psychological time, recursive ownership, and report that are not demonstrated in the flytrap architecture [23, 30, 64, 68–72, 95–102].

The first conclusion prevents neural anatomy from being treated as an unexplained starting boundary. The second prevents every biologically integrated event from being treated as equivalent to human consciousness. The remaining scientific question is which discontinuities alter the differentiation, content, temporal depth, ownership, and reportability of an organism-relative event, and which introduce conditions necessary for any inside view whatsoever.

The flytrap cannot settle that question, but it constrains it. Human phenomenology cannot simply be projected downward into the plant, while neural exclusivity cannot simply be asserted from the human case. Any proposed boundary must identify the relevant organization and explain why it is necessary rather than merely elaborative. This requirement leads to the problem of scaling: how biological continuity can be preserved without expanding the mapped domain indiscriminately, and how the special contributions of nervous systems can be recognized without treating neural tissue itself as an unexplained metaphysical threshold.

5.5 Scaling Without an Arbitrary Neural Boundary

The discontinuities identified in the preceding subsection show that nervous systems matter profoundly. Neural organization enables rapid long-distance signalling and, in sufficiently differentiated systems, dense recurrent interaction, multimodal differentiation, flexible learning, extensive memory, behavioural selection, counterfactual projection, recursive ownership, and report [64, 68, 95–107]. These capacities transform the content, temporal depth, flexibility, and accessibility of organism-relative events.

Their importance, however, does not by itself establish that phenomenology begins wherever neural tissue first appears, or at any later neural structure selected without further explanation. A biological boundary must be justified by the organization it introduces rather than named by anatomy alone.

A theory that makes neural tissue a necessary boundary must explain which neural organization is indispensable and why the more general relations present in non-neural organisms are insufficient.

This requirement does not presume that no such neural organization exists. Nervous systems may contribute a relation that is necessary for every inside view. The requirement is that the proposed relation be identified and shown to perform indispensable explanatory work. It is not enough to observe that conscious humans possess brains, or that cortex, thalamocortical and recurrent interaction, global availability, higher-order representation, behavioural flexibility, and report are prominent candidates in human consciousness research [64, 103–105]. Each candidate must be evaluated according to what it contributes to the bounded organism-relative event and whether that contribution concerns phenomenal occurrence itself, its differentiation, access, recursive ownership, or report.

The central question is therefore not where neurons first appear. It is what organization nervous systems make possible that is necessary for phenomenology itself, rather than for its differentiation, duration, flexibility, recursive ownership, or reportability.

This distinction is difficult because the strongest evidence concerning phenomenology comes from organisms with highly developed nervous systems. Humans can discriminate sensory qualities, compare states, report uncertainty, describe injury, and

communicate changes produced by pharmacological or neurological perturbation [30, 31, 64, 73–75, 107]. These capacities provide unusually rich access to phenomenology, but an evidential access condition should not automatically be converted into a condition of occurrence.

Report can reveal an event without constituting it. Metacognitive access can characterize an event without generating its primary registration. Autobiographical ownership can reorganize an event without being the organism-relative process from which the event began. The fact that a capacity enables investigators to detect or describe phenomenology does not establish that the same capacity is necessary for phenomenology to occur.

Language, for example, permits detailed report but cannot be the origin of every human phenomenal event. Memory permits delayed description, but an event need not enter autobiographical retention in order to have occurred. Motor expression supplies behavioural evidence, but internal organization may remain available when output is severely restricted [5–10, 30, 31, 64, 73–75, 102]. Recursive ownership permits the statement that an event "happened to me," but the primary event must already have occurred before it can be attributed to a narrator.

The boundary problem therefore requires at least four questions to remain distinct. What organization is required for a bounded organism-relative event? What additional organization differentiates its possible content? What permits selected aspects of the event to become recursively interpreted, attributed, and organized around a virtual reference point? What permits deliberate external report? A neural architecture may be indispensable to one of these functions without being indispensable to all of them.

Highly differentiated human vision, for example, depends upon specialized receptors, retinal processing, thalamic pathways, cortical differentiation, recurrent interaction, and wider organismic integration [29, 64, 103, 106]. The absence of this architecture provides no reason to attribute human colour vision to the flytrap. That conclusion concerns the differentiation and content of the event. It does not establish that every possible inside view requires visual cortex, thalamus, or neural tissue.

The same distinction applies to narrative selfhood. Autobiographical narration recruits memory retrieval, comparison, symbolic processing, attribution, and virtual self-reference [5–10, 69, 72, 96, 99, 102]. Explicit projection toward possible or future events may also occur within this organization but is not required for every autobiographical act. The flytrap provides no evidence of this recursive organization. That establishes a strong boundary around recursive ownership and narrated identity. It does not automatically establish the same boundary around primary organism-relative phenomenology.

The architecture must therefore be examined across several dimensions rather than treated as an all-or-none property appearing at one anatomical threshold. Differentiation concerns how many biologically distinct variables the system can register and preserve. Integration concerns how extensively those variables can influence one another within a developing event. Temporal depth concerns how long biological history can remain consequential and whether it can be reconstructed after the original disturbance has ended. Recurrence concerns the extent to which later processing modifies earlier or concurrent processing.

Behavioural flexibility concerns the range of available responses and the capacity to inhibit, delay, or reorganize them. Representational reach concerns whether processing remains tied to present disturbance or can recruit absent objects, symbolic relations, hypothetical futures, and alternative histories. Recursive ownership concerns whether an event remains organism-relative or becomes repeatedly attributed to a virtual autobiographical subject. Reportability concerns whether the event becomes available to confidence judgment, language, and deliberate communication.

These dimensions do not necessarily increase together. An organism may possess substantial sensory differentiation with limited self-reference. It may learn without language, retain information without autobiographical narration, or display complex behaviour without human-like metacognition. Even within humans, these capacities can dissociate [31, 36–40, 45–50, 53–55, 59, 60, 72–75, 107]. A single threshold of "complexity" is therefore uninformative unless the decisive dimension and its causal role are specified.

Complexity may refer to cell number, connectivity, diversity of cell types, recurrence, behavioural repertoire, memory duration, centralization, or metabolic demand. These properties are not equivalent. A larger system is not automatically more integrated. A more interconnected system is not necessarily more organism-relative. Greater metabolic expenditure does not imply richer phenomenology. Complexity cannot serve as a substitute for a mechanistic criterion.

Centralization illustrates the problem. Nervous systems can centralize processing and coordinate distant tissues with exceptional speed and flexibility [64, 68, 90, 91, 95, 106]. These capacities may be essential for the scale and unity of many animal events. Centralization alone, however, does not explain why distributed organism-relative organization must be excluded.

The flytrap capture event is distributed across trigger hairs, electrically excitable tissues, calcium-related signalling, a mechanically primed lobe architecture, broader ion- and water-regulatory processes, hormonal pathways, glandular activity, and metabolic restoration [65, 76–86]. It lacks a brain, but its capture sequence is not causally unorganized. If a central nervous system is necessary for phenomenology, the relevant contribution must be stated more precisely. It may involve binding highly differentiated content, sustaining recurrent availability, coordinating competing systems, or preserving integration across spatial and temporal scales. These are testable organizational proposals. The anatomical label alone is not an explanation.

Recurrence presents a similar challenge. Extensive neural recurrence is associated with sustained perception, integration, and conscious access in humans [64, 103]. Yet recurrence in the broader causal sense is not unique to nervous systems. Feedback, repeated recruitment, and state-dependent modification occur throughout living organization [24, 32, 65, 66, 77, 82]. A neural boundary based upon recurrence must therefore specify whether the relevant requirement is local amplification, long-range re-entry, cross-modal interaction, sustained availability, higher-order access, or self-referential recursion. These are distinct organizations, and several concern access, amplification, or narration rather than primary occurrence.

The term global likewise requires specification. It may mean distribution across a brain, availability to multiple cognitive systems, or coordination across the organism. The flytrap does not possess a human global workspace, but its capture sequence can extend across much of the trap and alter wider metabolic and regulatory conditions [65, 79, 81, 104]. If global neural availability is proposed as necessary, the theory must explain why access to memory, planning, action selection, and report constitutes the primary event rather than making an already occurring event available to additional systems.

The distinction between occurrence and access is central. A disturbance may be selectively registered and integrated without becoming available to every later process. Conversely, a representation can become widely available for abstract manipulation while lacking the immediate organismic consequence of a primary sensory or affective event. Global availability may therefore amplify, stabilize, and coordinate phenomenology without necessarily marking its absolute lower boundary [30, 64, 104].

Higher-order accounts make a different proposal: a first-order state becomes conscious, or conscious in the relevant sense, when it is appropriately represented by a higher-order state [105]. That proposal should not be reduced to the claim that a literal internal witness observes the first-order event. For the present boundary analysis, the relevant question is whether the proposed higher-order operation is constitutive of phenomenal occurrence itself or instead contributes to later access, discrimination, confidence, interpretation, ownership, or report. If higher-order representation is proposed as necessary for phenomenology, the relevant organization must therefore be independently identified and shown to occupy the causal and temporal position required for that constitutive role, rather than merely accompanying later accessibility or characterization of the event.

Behavioural flexibility and learning are also important but insufficiently precise as lower-boundary criteria. Nervous systems permit flexible selection, inhibition, adaptation, and action toward distant goals [68, 96, 97]. These capacities strongly indicate differentiated internal organization. Their absence does not establish phenomenal absence, because behavioural expression can be constrained independently of internal processing.

Learning similarly expands temporal depth and alters future registration and valuation [96, 97, 101]. Yet learning includes mechanisms ranging from simple habituation to associative learning, reversal, model-based inference, and autobiographical reconstruction. Without specifying which form is necessary and why, learning becomes another variable proxy for complexity.

The lower boundary cannot be located simply by selecting the most sophisticated capacity associated with human consciousness. Doing so defines the phenomenon at its richest known expression and excludes every less elaborate case by construction. A defensible approach instead asks how the underlying event architecture is altered as new biological organizations appear.

Biological scaling can instead be described across multiple dimensions without treating organisms as rungs on a single evolutionary ladder. A non-neural organism may exhibit maintained readiness, selective registration, finite persistence, state-dependent integration, organism-state-dependent differential biological organization, commitment, transformation, and active resolution. Within the present framework, that differential organization is the relation termed primary biological valuation. Nervous systems can add faster propagation, additional sensory differentiation, greater spatial coordination, broader learning, recurrent interaction, and flexible behavioural selection in many different combinations. More differentiated neural systems can support cross-modal integration, extended memory, competition among possible actions, counterfactual modelling, metacognition, and increasingly elaborate sensory worlds [64, 68, 95–107]. In humans, symbolic language, autobiographical continuity, recursive ownership, explicit report, and highly elaborated memory-dependent conscious thought operating through psychological time become especially prominent.

These examples do not describe a universal evolutionary sequence, nor do they imply that every listed capacity is uniquely human or appears only after the capacities preceding it. Different lineages combine and reorganize biological capacities in different ways. The purpose of the comparison is to show that new organization can transform an event across several dimensions without assuming in advance that one anatomical innovation marks the transition from non-phenomenal to phenomenal organization. Whether any particular transition is necessary for an inside view remains the question to be empirically and theoretically constrained.

A graded architecture does not imply that consciousness rises smoothly along one numerical scale. Qualitative transitions are possible. A new sensory system may introduce a new class of differentiated content. Long-term memory may allow distant history to modify the present. Counterfactual processing may make absent possibilities biologically active. Language may introduce symbolic and socially transmitted organization [9, 10, 95–102, 106]. Recursive ownership may generate the apparent continuity of a subject. These are new forms of organization rather than larger quantities of one property.

The framework therefore permits both continuity and emergence, but emergence must be explained. A defensible emergence claim must identify the prior organization, the new biological relation, the transition through which it arises, and the reason that relation is necessary for the target phenomenon. Without those elements, emergence merely renames the explanatory gap.

The Venus flytrap places pressure upon any boundary justified solely by neural anatomy because it already exhibits several of the constituent relations under investigation. It selectively registers stimulation, preserves biological consequences, integrates across time, undergoes state-dependent threshold transitions, differentially organizes biological outcomes, changes its own condition, and actively restores future availability [65, 66, 76–86]. These observations do not establish that the complete organization is sufficient for phenomenology. They establish the narrower empirical point that these constituent relations are not exclusive to nervous systems and therefore cannot be reserved for neural organisms by definition.

If a neural boundary remains necessary, its justification must therefore concern some additional organization absent from the demonstrated flytrap sequence.

The present framework carries an equal burden. It cannot place every integrated non-neural event within the phenomenal domain merely because doing so preserves continuity. Growth, repair, immune regulation, gene expression, metabolism, and local chemical reactions are also organism-relative in broad senses. Many involve signalling, feedback, thresholds, and restoration [24, 32, 42, 82]. The mapped unit must consequently be narrower than living activity as a whole.

The candidate boundary concerns a coordinated and bounded transition in which a disturbance is selectively registered, its consequences persist sufficiently to influence later processing, multiple conditions are integrated, present organismic state constrains the result, the disturbance is differentially organized according to biological consequence, commitment alters the system's available states, and resolution preserves or reorganizes future availability. Whether this organization is sufficient remains a theoretical question, but it supplies a more discriminating object of investigation than the categories neural and non-neural.

The correct boundary must ultimately be operationally vulnerable. Where sufficiently selective perturbation is possible, a neural organization claimed to be necessary should be disrupted while lower-level metabolism, local responsiveness, and other relevant functions are independently measured [54, 63, 64]. The predicted phenomenal capacity, or independently justified measures used to constrain it, should be lost or systematically degraded and should recover when the proposed organization is restored. Because biological perturbations can produce collateral effects, necessity cannot be established from lesion or output failure alone; convergent dissociation, preservation of lower-level functions, and recovery are required [31, 53, 54, 63, 64, 73–75]. Conversely, inclusion of a non-neural event requires a prespecified measurable organization and perturbations showing that the integrity of the candidate event depends upon that organization. In organisms without report, such experiments directly test the proposed biological event architecture; they do not by themselves prove the existence of an inside view.

The debate should therefore turn on which relations are necessary, which amplify or differentiate content, and which are required specifically for access, self-recognition, or report. Anatomy remains indispensable because it identifies the physical systems through which these relations are implemented. It does not end the explanation.

Nervous systems mark an enormous expansion in the possible differentiation, recurrence, temporal depth, flexibility, and recursive accessibility of organism-relative events. What they do not provide by their material identity alone is a self-explanatory metaphysical divide. The boundary must be earned mechanistically.

That requirement applies equally to theories that exclude the flytrap and to the present framework if it proposes inclusion. The next task is therefore to state the comparative constraints directly: what prevents the organism-relative identity proposition from becoming too narrow to accommodate biological continuity or too broad to remain scientifically discriminating.

5.6 Comparative Constraints on the Organism-Relative Identity Proposition

The comparative analysis places constraints not only upon theories that reserve phenomenology for neural organisms, but upon the organism-relative identity proposition itself. Its domain cannot be defined around whichever organisms are already assumed to be conscious, nor can it be expanded to every living process that consumes energy, responds to disturbance, or contributes to survival. The first strategy would preserve neural exclusivity without explaining it. The second would make the framework biologically indiscriminate.

If the mapped unit were restricted in advance to human thalamocortical activity, the flytrap comparison would become irrelevant by definition. The theory would identify a familiar neural implementation while leaving unexplained which organization makes that implementation necessary. If, by contrast, every metabolic, regulatory, or adaptive process qualified, growth, repair, immune activity, gene regulation, digestion, and ordinary cellular transport would enter the proposed phenomenal domain merely because they are energy-dependent and organism-serving.

The relevant domain must therefore be narrower than life as a whole without being restricted to one tissue type by assumption.

Three levels of claim must remain distinct. The biological evidence establishes that the Venus flytrap instantiates a temporally extended, state-dependent, integrated, energetically consequential, and actively resolved transition [65, 66, 76–89]. The comparative argument establishes that several relations within this transition are not exclusive to nervous systems. The organism-relative identity proposition makes the further theoretical claim that a sufficiently complete bounded event of this kind possesses an inside view.

Only the first two conclusions follow directly from the comparative biology. The identity proposition must earn support through explanatory coherence, perturbational testing, dissociation, successful exclusion of partial analogues, and its ability to relate independently identifiable biological organization to the preservation or abolition of the proposed event. It remains a theoretical identity claim under empirical constraint.

A candidate event should not qualify because it exhibits one isolated property. Selective responsiveness is insufficient. Persistence, threshold crossing, feedback, energetic expenditure, or adaptive benefit are each insufficient. Even their loose co-occurrence may fail to identify the mapped unit unless they form a coordinated biological transition.

The proposed target is the complete relation among them.

Provisionally, a candidate mapped event must be a bounded transition within a living nonequilibrium system in which a disturbance is selectively registered, remains consequential across time, is integrated with the organism's present condition and retained history, is differentially organized according to its biological consequences for that system, recruits a coordinated

alteration of biological state, and undergoes regulated resolution or incorporation sufficient to define the developing transition and its consequences. In recurrent viable conditions, this resolution should preserve or reorganize future functional availability.

Each requirement constrains the others. Selective registration excludes undifferentiated physical disturbance. Persistence excludes changes that disappear before they can alter later organization. Integration excludes isolated reactions whose consequences remain confined to one local interaction. Organism-relative differential organization excludes transitions that are not altered according to the state, vulnerabilities, and possibilities of the living system; within the present framework, this relation is termed primary biological valuation. Coordinated transformation excludes processes that alter one molecule or compartment without changing the functional condition of a wider biological unit. Regulated resolution distinguishes an organized transition from simple passive decay and helps establish its functional boundary. Renewed availability is expected when the living system remains capable of further events, but return to a previous baseline is not required.

Resolution is therefore a property of the complete event trajectory, not a claim that phenomenology begins only after recovery. Prolonged or terminal conditions may contain bounded organism-relative transitions even when the organism does not return to its previous state or ultimately loses the capacity for further events. Terminal breakdown itself is not thereby classified as a mapped event merely because it is biologically consequential.

These conditions do not demonstrate that the resulting event possesses phenomenology. They define the biological organization to which the identity proposition applies.

This distinction is necessary for testability. The target must be identifiable from the exterior before the phenomenological claim is introduced. Otherwise, the theory would become circular: the event would be classified as phenomenal because it possesses an inside view, while the inside view would be inferred because the event had already been classified as phenomenal.

The flytrap is useful precisely because its capture event can be characterized without relying upon subjective report. Trigger-hair displacement, electrical propagation, calcium-related dynamics, temporal persistence, threshold-dependent closure, mechanical transformation, hormonal signalling, metabolic effects, glandular activation, reopening, and recovery can all be investigated independently [65, 66, 76–89]. The identity proposition is then applied to a biological transition whose exterior organization has already been specified. This ordering does not by itself prove the identity, but it prevents phenomenological language from concealing an undefined biological target.

The requirement of boundedness is especially important. A bounded event need not be confined to one anatomical structure, nor must every component begin and end simultaneously. Its boundary is causal and functional. It concerns the organized interval during which a particular disturbance is registered, modifies the state of the system, interacts with retained conditions, recruits coordinated transformation, and is subsequently resolved or incorporated.

The participating processes may extend across multiple tissues and timescales. In the flytrap, stimulation begins at a trigger hair but can recruit the wider lobe, electrical and calcium-related propagation, mechanical transformation, broader ion- and water-regulatory processes, hormonal signalling, digestive activity, metabolic reorganization, and later reopening. In humans, a disturbance may recruit sensory receptors, distributed neural activity, vascular and autonomic adjustment, bodily preparation, memory, and later recursive interpretation [23, 24, 33–35, 42, 64–66, 68, 69, 76–92, 95–107].

The event boundary therefore cannot be determined by location alone. It cannot be determined solely by duration either. Some components recover quickly while others leave longer consequences. Membrane voltage may return toward baseline while calcium-related effects persist. Behaviour may cease while autonomic recruitment continues. A primary event may resolve while its retained consequence later becomes material for another event [12, 13, 21, 22, 66, 77, 79, 80].

The relevant boundary is organized causal continuity, not the simultaneous return of every variable to its prior value.

Drawing the boundary too narrowly would identify the event with one transient signal while omitting the wider organismic transformation. Drawing it too broadly would turn the continuous life of the organism into one undifferentiated event. The framework must therefore recognize nested levels of biological activity.

A local electrical change may be one component of a larger transition. A threshold sequence may form an intermediate organization. A capture cycle or perceptual event may constitute the wider organism-relative unit. The candidate mapped level should be the least inclusive level at which selective registration, operative persistence, integration with present condition, organism-relative differential organization, coordinated transformation, and resolution form a causally coherent whole. This criterion does not assume that biological scale is always unambiguous; it constrains the choice against both local truncation and indiscriminate expansion to the organism's entire continuing activity.

This does not require every mapped event to encompass the entire organism as an undivided physical object. Biological organization is hierarchical. An organ, neural network, or specialized regulatory system may temporarily form a bounded functional unit while remaining dependent upon the wider organism. The critical question is whether its transition is organized relative to the maintained condition and future possibilities of the living system, rather than remaining an isolated local reaction.

The flytrap capture organ satisfies this condition more fully than an individual ion channel. The trap integrates successive disturbances, alters its electrical, mechanical, metabolic, and regulatory condition, recruits downstream functions, and changes its future availability [65, 66, 76–89]. An ion channel contributes to the transition but does not contain the complete event.

The same distinction applies to humans. One neuron may fire, one synapse may change, or one cortical region may increase its activity. None of these observations alone identifies the complete organism-relative event. The relevant unit is the coordinated transition into which these local processes are recruited.

The identity proposition therefore concerns neither a privileged molecule nor an individual action potential. It applies to the organized event of which those processes are components. No local mechanism generates phenomenology as an additional product detached from the wider transition.

Organism-relative differential organization must also be distinguished from general biological usefulness. Protein synthesis, DNA repair, filtration, growth, and immune regulation all support the continued existence of an organism. Their contribution to viability is not sufficient to make each process a bounded organism-relative event of the kind proposed here.

Within the present architecture, primary biological valuation is the theoretical term for the way a present disturbance is differentially organized according to the organism's current condition, retained history, vulnerabilities, and available responses. The differential biological organization is the empirically assessable relation; its characterization as valuation belongs to the framework. A disturbance may be amplified, attenuated, opposed, integrated, or converted into commitment because of its consequences for the continuing organization of the living system. This is substantially narrower than the claim that every useful biological process possesses organism-relative valuation.

Temporal persistence provides a further constraint. A local reaction may be biologically consequential without forming a temporally integrated event. A molecule may bind to a receptor and initiate a fixed chemical sequence, yet fail to preserve a state through which a later disturbance is processed differently. The proposed architecture requires history to become operative within the transition.

The system must not merely change. It must change in a manner that alters the biological consequence of what happens next.

In the flytrap, a first qualifying stimulation changes the effect of a second. In humans, prior sensory, interoceptive, affective, attentional, and mnemonic conditions continually alter the development of present events [9, 10, 12, 13, 21–24, 56, 57, 69, 95–101]. Historical dependence prevents the mapped unit from collapsing into instantaneous reactivity.

Integration must likewise mean more than summation in its most general sense. Chemical quantities can combine, electrical charge can accumulate, and several mechanical forces can produce one output. The relevant form of integration occurs when multiple conditions jointly determine a change in the state and possibilities of the living system.

Those conditions may include present stimulation, retained prior activity, metabolic capacity, developmental state, bodily condition, and the stage already reached within the event. Their relation is not merely additive. The same disturbance may produce a different transition because the system receiving it is no longer in the same condition.

This is why perturbation and dissociation are central to testing the architecture. The proposed operations should be measured separately and, where suitable interventions exist, perturbed independently or differentially [54, 63, 64]. The framework predicts candidate dissociations in which registration may remain while persistence is shortened, persistence may remain while wider integration is weakened, electrical signalling may remain measurable while mechanical execution is disrupted, metabolic recruitment may occur without complete commitment, behavioural output may fail while earlier internal organization remains, or resolution may be delayed while initiation is preserved [31, 53, 54, 64, 73–75, 79–81, 86]. These are experimental tests of the proposed architecture rather than assumptions that every operation can be cleanly isolated in every biological system.

Such dissociations can reveal whether the event is a single undifferentiated mechanism or a coordinated architecture composed of separable but interdependent operations. They also prevent the identity proposition from being inferred solely from visible behaviour.

An overt response shows that at least one causal route from the initiating condition to observable output remained functional. It does not by itself identify which earlier operations were necessary or whether the same internal organization produced the response across different cases. Its absence likewise does not establish which earlier processes failed. Similar behaviour can arise through different causal pathways, while internal organization may remain partly preserved despite failure of overt output [30, 31, 64, 73–75]. The theory must therefore track the developing biological architecture rather than classify systems by external performance alone.

This creates a demanding obligation. If two systems produce comparable behaviour but only one instantiates the complete proposed organization, behavioural equivalence should not be treated as sufficient evidence of phenomenal equivalence. The allegedly missing organization must be specified and measured; otherwise, the framework would merely assert an invisible difference whenever behaviour failed to settle the question.

The present formulation is deliberately grounded in living nonequilibrium systems. It does not establish that artificial phenomenology is impossible. An engineered system might possess memory, thresholds, recurrence, adaptive control, internal-state monitoring, and complex behaviour. The framework would nevertheless ask whether those functions form a physically integrated and bounded organization in which the system actively maintains the conditions of its own continued existence, registers disturbances according to consequences for that maintained condition, and resolves them through a transition that changes its future possibilities.

The current biological restriction therefore marks the evidential and theoretical scope of the proposal, not a proof that equivalent organization cannot be engineered. Extension beyond living systems would require demonstrating that the relevant physical relations, rather than only their abstract description or input-output profile, had been reproduced.

The comparative constraints consequently operate in both directions. Against an excessively narrow theory, they require an explanation of why non-neural registration, persistence, integration, organism-state-dependent differential biological organization, commitment, and restoration remain insufficient. Against an excessively broad theory, they require more than

metabolism, feedback, adaptation, or causal complexity. Against the present framework itself, they require precise event boundaries, independently identifiable biological conditions, and evidence that the proposed organization tracks phenomenology more closely than alternative biological descriptions.

The identity proposition is therefore vulnerable in several specific ways. It would be weakened if the candidate architecture proved ubiquitous across biological processes that the framework has principled reason to exclude but could not distinguish by independently specified criteria. Where an organization is proposed as necessary, credible evidence of preserved phenomenology despite its disruption would count against that claim; where it is proposed as sufficient, preservation of the proposed organization without the corresponding phenomenology would count against sufficiency. The proposition would also be weakened if the proposed Friction Signatures tracked general metabolism or stress rather than the organization, disruption, or preservation of the candidate bounded event.

A further vulnerability concerns the choice of scale. If the framework cannot explain why one level of nested biological activity constitutes the mapped unit while another does not, its boundaries remain underdetermined. These are not peripheral objections. They define the empirical obligations through which the identity proposition becomes scientifically meaningful.

The flytrap does not remove these risks; it sharpens them. It demonstrates that candidate relations can be studied outside human neural architecture, while simultaneously exposing the danger of overextension. The framework must explain why the complete capture event is theoretically relevant while an individual cellular reaction is not. It must remain open to the possibility that the flytrap satisfies the minimum organization, approximates it without completing it, or lacks an additional relation necessary for any inside view.

The comparative conclusion is therefore provisional but substantive. The mapped domain should not be defined by tissue, behaviour, metabolic cost, or abstract complexity. It should be defined by a coordinated biological organization whose components can be measured independently, disrupted selectively, and related to the preservation, alteration, or abolition of the complete event.

The candidate organization includes a maintained living system, selective registration of disturbance, persistence sufficient to make history operative, integration with present condition, organism-state-dependent differential biological organization, coordinated transformation, regulated resolution or incorporation, and renewed or altered biological availability where continued viability permits it. Within the present framework, the differential organization is the relation termed primary biological valuation. This structure has not been shown sufficient, but neither has it been selected arbitrarily. It has been extracted from the comparative architecture developed across Sections 4 and 5.

Its function is to identify what the organism-relative identity proposition must explain and what subsequent evidence must test.

One physical question remains immediately unresolved. How does a living system continually maintain the gradients, readiness, temporal traces, thresholds, coordination, and restorative capacity required for these events despite leakage, molecular noise, fluctuating demand, and environmental disturbance?

Answering that question requires a systems-level account of the distributed biological work operating before, during, and after the bounded transition.

5.7 Transition to the Stochastic Pump

The comparative analysis has identified a recurring physical problem. Before a bounded organism-relative event can occur, the living system must already possess the capacity to register a disturbance, preserve its consequences, integrate changing conditions, enter a coordinated state-transition, and later recover sufficient availability for further events. That capacity cannot be treated as a passive background.

Electrical excitability depends upon membrane potentials and ion gradients established before stimulation. Calcium signalling depends upon unequal concentrations maintained across cellular compartments. Water distribution and hydraulic regulation depend upon controlled movement of water and solutes. Mechanical responsiveness depends upon prepared tissue geometry, stress, material properties, and stored mechanical energy. Metabolic and transport processes must continually supply usable energy, replace resources, regulate chemical conditions, and restore altered gradients [32, 77, 78, 82, 84, 85, 90, 91]. At every stage, the event depends upon biological work that began before the initiating disturbance.

The event can also leave further work behind. Ion distributions may have changed, calcium-related conditions may remain altered, mechanical or water-regulatory relations may have been reorganized, metabolic resources may have been recruited, and regulatory pathways may remain active [32, 77–79, 82]. The organism may have entered a condition whose stabilization, incorporation, or resolution requires continued biological activity. The complete transition therefore cannot be explained solely by the mechanism producing its most visible response.

Trap closure does not explain how the open trap was maintained in a sensitive and mechanically prepared condition. An action potential does not explain how the gradients supporting it were established. A threshold does not explain how the variables approaching it remained available across time. Repolarization alone does not explain how the system regains the wider electrical, chemical, metabolic, hydraulic, and mechanical organization required for another event.

The unresolved problem is therefore not simply how a living system responds to stimulation. It is how the system continually maintains and reconstructs the physical conditions through which organized responsiveness remains possible.

This problem is present in both the Venus flytrap and the human organism. In the flytrap, trigger-hair sensitivity, membrane excitability, calcium regulation, broader ion- and water-regulatory conditions, mechanical preparation, metabolic supply, glandular recruitment, and reopening depend upon processes distributed across tissues and timescales [65, 76–89]. No single component performs the complete task. An ion channel contributes to electrical change but does not supply metabolic resources. A proton pump contributes to gradient formation but does not contain the capture sequence. Calcium transport contributes to signalling and recovery but does not by itself explain mechanical preparation, digestive activation, or reopening. Respiration supplies usable energy but does not specify how that energy is organized into registration, persistence, commitment, transformation, and restoration.

The capture event arises through the coordinated participation of these processes rather than from any one mechanism considered in isolation.

The same requirement is more extensively distributed in humans. Neural signalling depends upon ion pumps and channels, transmitter synthesis, vesicle cycling, glial regulation, oxygen and glucose delivery, vascular adjustment, temperature control, waste removal, autonomic support, endocrine condition, and continuing bodily regulation [24, 33–35, 42, 90, 91, 109]. A perceptual or affective event may recruit several of these systems without any single anatomical structure performing the whole maintenance-and-restoration function.

The nervous system does not produce its own conditions of operation independently of the organism. Its activity remains dependent upon wider processes that supply, regulate, stabilize, and restore it.

This distributed dependence becomes especially important when events are recurrent or prolonged. A brief disturbance may recruit a relatively limited transition. A recursively sustained human event may repeatedly reactivate memory, attention, bodily arousal, self-reference, and anticipation [12, 13, 21, 22, 69]. Each recurrence alters the biological condition encountered by the next. The physical problem is therefore not completed when the first signal has propagated. Maintenance, recruitment, disturbance, coordination, and restoration overlap throughout the developing event.

A systems-level concept is required to describe this continuity of biological work. The term Stochastic Pump will be used to identify the distributed process through which established biological mechanisms maintain, recruit, coordinate, and restore the nonequilibrium conditions required for bounded organism-relative transitions.

The term does not denote a newly proposed molecular structure, a single anatomical site, or a centralized engine. Molecular pumps are among its components, but they do not individually constitute the systems-level process. Ion pumps establish and restore electrochemical gradients; channels mediate selective ion flux across membranes; metabolic pathways supply usable energy; transport systems redistribute molecules and solutes; vascular or hydraulic processes support supply and movement; chemical signals coordinate local and distributed changes; and regulatory feedback constrains disturbance and contributes to restoration [24, 32–35, 77, 78, 82, 90, 91, 109].

The Stochastic Pump names the coordinated functional relation among these activities as they preserve and recover organized biological availability. Its precise status and implementation will be developed in the following section.

The word stochastic emphasizes that this work occurs amid unavoidable physical variability. Molecules collide, membranes leak, channels fluctuate between states, chemical concentrations vary, and internal processes compete for finite resources [32, 108]. Environmental disturbances further alter the organism under conditions that cannot be perfectly controlled. Biological organization does not eliminate this variability; it remains functional by regulating through it.

Stochasticity is therefore not proposed as a substance or force that generates phenomenology. Nor does random fluctuation automatically improve biological function. Unregulated variability can degrade signalling, destabilize gradients, damage structures, and reduce the reliability of response [32, 108]. The relevant achievement is the preservation of functional distinctions and coordinated transitions despite noise, leakage, finite resources, and changing demand.

The living system must remain sensitive without responding indiscriminately. A consequence must persist long enough to influence later processing without remaining indefinitely active. Thresholds must remain responsive without every fluctuation producing commitment. Disturbed variables must recover sufficiently for later events to remain separable. These requirements make maintenance and restoration integral to the physical architecture of the event.

The Stochastic Pump and the bounded organism-relative event must nevertheless remain distinct. The Pump describes the distributed biological work through which relevant physical conditions are maintained, recruited, and restored. The event is the particular organized transition in which those conditions are recruited in relation to a disturbance.

The flytrap illustrates this distinction. Electrical gradients, calcium regulation, metabolism, broader ion- and water-regulatory processes, mechanical preparation, and restorative processes operate before any insect contacts a trigger hair. They maintain an open, excitable, and mechanically primed trap. When a qualifying disturbance occurs, selected aspects of this maintained capacity are recruited into electrical and calcium-related propagation, temporal persistence, threshold integration, rapid epidermal cell-wall softening, release of stored elastic energy and snap-through, and possibly later sealing and digestion. Afterward, distributed biological work contributes to electrical and calcium regulation, resource replenishment, broader physiological reorganization, metabolic recovery, and reopening [65, 66, 76–89].

The maintenance process operates across the capture event, but it is not identical to the capture event itself.

The same distinction applies in humans. Continuous neural, vascular, metabolic, glial, autonomic, and bodily maintenance precedes any particular sound, colour, pain, memory, or thought. A specific event recruits selected aspects of this maintained

capacity. Its development may change vascular demand, autonomic condition, muscular readiness, attention, memory access, and later behaviour [12, 13, 21–24, 33–35, 42, 90, 91, 109]. Restoration returns some variables toward previous ranges while incorporating other consequences into the organism's continuing history.

The bounded event is the particular transition. The Stochastic Pump is the distributed biological process that makes its formation, persistence, and resolution physically possible.

This distinction prevents the framework from identifying phenomenology with metabolism in general. The constituent maintenance processes also support growth, repair, secretion, digestion, transport, and baseline regulation [24, 32–35, 42, 82]. Their presence is therefore not sufficient to establish the mapped event.

The Pump is necessary to the Grind, but pump activity alone is not sufficient for the Glow.

ATP consumption does not independently establish phenomenology. Ion pumping does not independently establish phenomenology. Restoration of membrane potential does not independently establish phenomenology. Metabolic heat does not independently establish phenomenology [32–35, 42, 44, 90]. These processes become relevant to the identity proposition only through the complete biological organization in which they participate.

The proposed inside view belongs to the bounded organism-relative event, not to an isolated molecular component or to a quantity of dissipated energy.

Different events will also recruit different implementations of the maintenance process. Flytrap closure recruits plant electrical and calcium-related signalling, a mechanically primed trap, rapid modulation of epidermal cell-wall mechanics, snap-through, broader ion- and water-regulatory processes, and metabolic restoration. Human visual processing recruits retinal transduction, neural signalling, recurrent integration, vascular support, and wider organismic regulation. Autonomic events recruit cardiovascular, respiratory, endocrine, and interoceptive systems more strongly. Recursive narration may repeatedly recruit memory, self-referential processing, bodily arousal, and sustained regulatory support [12, 13, 21–24, 29, 34, 64–66, 69, 76–86, 103, 106].

There may therefore be no single anatomical object corresponding to the Stochastic Pump. The construct is identified through the coordinated function performed by established components across the relevant biological system.

This makes the concept empirically demanding. A systems-level term is useful only if it can be decomposed into measurable operations. Its proposed role must remain connected to the establishment and restoration of gradients, maintenance of excitability, supply and redistribution of resources, regulation of chemical and hydraulic conditions, containment of disturbance, support of coordinated transformation, and recovery of future availability.

Its relevance cannot be inferred merely from the continued life of an organism. The empirical question is how distributed biological work changes during a particular bounded event and how those changes relate to its initiation, persistence, disruption, and resolution.

This is also the point of contact with the Friction Signatures. Recruitment of additional electrical, chemical, metabolic, vascular, autonomic, hydraulic, or restorative work should produce measurable changes in the exterior condition of the system. These may include changes in respiration, oxygen or glucose use, ion-transport demand, heat production, blood flow, photosynthetic performance, autonomic regulation, or recovery dynamics [16, 21, 33–35, 42, 44, 79, 90, 91].

No single measurement defines the Stochastic Pump, and no single measurement defines the bounded event. Their scientific value lies in whether convergent patterns track the organized transition rather than general biological activity alone.

The resulting hierarchy must remain clear. Established biological components perform the physical work. Their coordinated event-relevant maintenance, recruitment, and restoration constitute the systems-level process described as the Stochastic Pump. That process implements and sustains the bounded organism-relative transition. Its measurable consequences appear externally through Friction Signatures. The Glow is proposed as the organism-relative inside view of the complete event, not as an additional output produced by the Pump.

Maintaining these distinctions prevents molecular pumps from being treated as consciousness mechanisms in isolation, metabolic cost from being equated with phenomenal intensity, and the systems-level construct from becoming a hidden substance or unexplained causal agent. It also prevents the bounded event from being reduced to the work required to support it.

Sections 4 and 5 have established why distributed maintenance-and-restoration work is required. A living system must preserve readiness before disturbance, sustain propagation and integration during the event, tolerate the controlled destabilization involved in commitment, and restore or reorganize the resulting condition. It must do so repeatedly despite noise, leakage, resource limits, and environmental change [24, 32, 77–79, 90, 91, 108].

The Stochastic Pump names the proposed systems-level organization of this physical continuity across the event. The next task is to define its status precisely, identify the established biological mechanisms through which it is implemented, explain its role across the bounded transition, and establish why that supporting organization is necessary without being sufficient for phenomenology.

6.0 The Physical Support Architecture of the Bounded Event

6.1 The Physical Problem of Living Organization

The physical conditions that make a bounded organism-relative event possible do not begin with the disturbance that makes the event externally visible. Before a trigger hair is displaced, a receptor activated, or a neural population changes its activity, the living system must already possess the physical capacity to respond. Membrane potentials must be maintained, ions and signalling molecules kept unequally distributed, receptors and transport systems preserved in functional states, and metabolic, hydraulic, vascular, mechanical, and regulatory conditions held within ranges that permit coordinated change [24, 32–35, 77, 78, 82, 90, 91].

The initiating disturbance therefore acts upon an actively prepared system. Although this preparation precedes event-specific recruitment, it is not an inert background condition. It is a continuing biological achievement upon which the bounded transition depends.

Living organisms persist by maintaining structured differences that would otherwise decay. Concentration gradients are eroded by diffusion, membranes leak, molecular components undergo damage and turnover, metabolic resources are consumed, and chemical reactions generate waste. Thermal fluctuation and molecular variability continually perturb local conditions, while environmental changes alter temperature, hydration, nutrient availability, chemical balance, and mechanical load [32, 108]. Biological organization is maintained through these disturbances rather than in their absence.

This creates the fundamental physical problem addressed in this section: how can a living system remain selectively available for consequential change while the events it undergoes disturb the very conditions that make such change possible?

The problem has three inseparable aspects. The system must preserve readiness before an event, support coordinated transformation while the event develops, and restore or reorganize the affected conditions afterward. These processes overlap. Maintenance does not cease when signalling begins, and restoration does not wait until every other phase has ended. Preservation, recruitment, disturbance, containment, and recovery operate together across the transition.

The Venus flytrap makes this organization visible in a comparatively compact biological system. Before stimulation, the trap is already electrically excitable, mechanically prepared, hydraulically organized, and metabolically supported. Contact with a trigger hair does not create these conditions. It recruits a capacity established through prior biological work [76–86].

The resting electrical condition depends upon maintained ion distributions and active transport. Calcium is kept unequally distributed across cellular compartments. The lobes possess a prepared geometry, mechanical condition, and stored elastic energy from which rapid snap-through can be recruited. The tissue remains supplied with the resources required for signalling, closure, continued stimulation, and later recovery [77–79, 82, 84, 85].

A qualifying disturbance temporarily redirects this maintained organization. Channels open, electrical and calcium-related conditions change, and signals propagate beyond the point of contact. The consequence of one stimulation can persist long enough to alter the effect of another. When the developing state reaches the relevant transition condition, rapid softening of the epidermal cell wall releases stored elastic energy, allowing the mechanically prepared trap to undergo snap-through. Continued stimulation may recruit sealing, hormonal signalling, glandular activation, and digestion [65, 66, 77, 80, 81, 84, 85].

Every phase depends upon conditions established before it began, and every phase also changes those conditions. Ions cross membranes, electrical potentials shift, calcium-related changes may outlast the fastest electrical component, water and solutes are redistributed, tissue geometry changes, metabolic resources are recruited, and regulatory pathways may remain active [77–82, 86]. The trap is no longer in the same functional state from which the sequence began.

Closure is therefore not the completion of the physical event. It is one phase within a larger transition whose consequences must be supported, contained, and eventually resolved. Some variables begin recovering rapidly, while others remain altered over longer intervals. If no prey is retained, the trap must restore sufficient electrical, hydraulic, mechanical, and metabolic organization to reopen. If prey remains, the system enters a different trajectory involving sealing, digestion, nutrient acquisition, and later reavailability [65, 79, 81, 86–89].

Resolution does not mean exact molecular reversal. The organism does not return to an identical physical state. It restores sufficient functional organization to continue living and to remain capable of subsequent events while incorporating any lasting consequences of what has occurred.

The same physical problem appears in the human organism within a far more differentiated architecture. A perceptual event depends upon receptors already maintained in responsive states, neurons with preserved electrochemical gradients, synapses capable of transmission, metabolic pathways able to supply usable energy, and vascular systems able to adjust oxygen and nutrient delivery. Neural activity also depends upon glial regulation, circulation, respiration, temperature control, fluid balance, endocrine condition, autonomic support, and the removal of metabolic products [24, 33–35, 42, 90, 91, 109].

The brain does not sustain its normal organization independently of these wider organismic processes.

A sensory event recruits only part of this maintained capacity, but its consequences may extend across several levels. Receptor activity can alter neural integration; integration can redirect attention; valuation can recruit autonomic change; autonomic change can affect breathing, cardiovascular state, muscular readiness, and later perception. Memory may reactivate earlier organismic conditions, while action preparation changes the sensory and bodily state encountered moments later [21–24, 68, 69, 95–97].

The event therefore develops through a system that is itself changing. Each phase modifies the conditions inherited by the next.

This historical dependence requires selective persistence. If every biological alteration disappeared immediately, later input could not be integrated with earlier state. If every alteration remained indefinitely, the system would lose the capacity to distinguish events and regain functional readiness. Living organization must therefore regulate not only what changes, but which consequences remain operative and for how long.

Some changes must persist long enough to affect subsequent processing. Others must be reversed before they destabilize the system. Still others may be incorporated into memory, learning, altered regulatory condition, or structural adaptation [24, 66, 94, 96, 97, 101]. The physical problem is therefore not simply the preservation of information. It is the preservation of biologically relevant consequences for appropriate durations while the conditions required for continued operation are restored.

The event and the processes supporting it are not independent. Electrical signalling uses gradients whose restoration requires metabolic work. Mechanical action redistributes resources whose replenishment may outlast the movement. Sustained attention recruits neural and vascular support that alters the wider energetic condition of the organism. Autonomic mobilization may facilitate action while creating a later regulatory burden. Memory formation preserves selected consequences while other aspects of the original event resolve [12, 13, 24, 33–35, 90–94, 96].

The system must therefore support transformation without allowing transformation to destroy the capacity for future transformation.

Living responsiveness consequently has a recurrent physical organization. The organism maintains a viable range of possible states. A disturbance moves selected variables away from that maintained condition. The system permits and coordinates some departures because they contribute to registration, integration, valuation, and action, while regulatory processes oppose uncontrolled loss of organization. Resolution concerns the containment, incorporation, reversal, or reorganization of the disturbance and its consequences. Where continued viability permits, this ordinarily restores sufficient organization for a viable range of future possibilities.

Recovery does not always restore the condition that preceded the event. Learning alters future registration, injury changes future vulnerability, nutrient acquisition modifies metabolic state, repeated stress can shift regulatory baselines, and development changes the architecture through which later disturbances are processed [12, 13, 24, 27, 67, 87–89, 96, 101]. Resolution therefore means restoration of organized continuity rather than restoration of an untouched past.

An event can end even though some of its consequences remain. A flytrap may reopen after incorporating nutrients acquired through digestion. A human autonomic response may settle while a memory persists. An injury may cease to function as an immediate sensory crisis while continuing to alter movement, expectation, and later valuation [5–10, 12, 13, 24, 27, 86–89, 96, 101]. Persistent consequences do not make the original event indefinitely extended; they change the condition from which subsequent events begin.

The physical work supporting this sequence cannot be assigned to one component. An ion pump does not integrate the event. A channel does not supply its complete metabolic support. A mitochondrion does not determine organism-relative valuation. A vascular response does not contain the sensory organization it sustains. A regulatory pathway does not independently constitute the bounded transition. Each participates in a wider coordination.

The difficulty is therefore partly one of levels of description. At molecular and cellular levels, identifiable pumps, channels, receptors, enzymes, transporters, signalling molecules, and metabolic pathways perform particular operations. At tissue and organismal levels, these operations must be coordinated across space and time [24, 32–35, 77–82, 90, 91, 109]. At the event level, their coordinated activity preserves and restores the conditions through which a particular disturbance becomes registered, retained, integrated, valued, transformed, and resolved.

A systems-level account cannot replace these mechanisms, but neither can it be reduced to a list of them. A list identifies the participating components. It does not yet explain how their relations collectively maintain readiness, permit controlled destabilization, support coordinated commitment, and rebuild future availability.

The same molecule or pathway may participate in growth, repair, secretion, movement, digestion, perception, or recovery [32, 82]. Its role depends upon the wider organization into which it is recruited. The relevant problem is therefore not to locate a special source of biological energy or a hidden central engine. It is to identify the distributed functional relation through which established mechanisms jointly maintain and restore the conditions of the bounded living system.

That relation must extend across the event without becoming identical to it. Maintenance is active before a particular disturbance occurs, is differentially recruited as the event develops, and contributes to containment and restoration afterward. The bounded event itself is defined by the way this maintained capacity becomes organized around a particular consequential change.

This distinction also prevents energetic expenditure from becoming the explanatory target. All living activity requires energy. Increased metabolic demand can indicate that additional biological work is occurring, but it does not identify what that work is accomplishing [32–35, 42]. The relevant issue is not energy magnitude alone. It is the organization being maintained, altered, coordinated, and restored through that expenditure.

Comparable energetic costs can support different functions, while events of different absolute scale may share a coherent functional organization. A larger expenditure does not necessarily indicate a richer organism-relative event, and a smaller organism may instantiate an integrated transition at far lower total cost [33–35, 42, 79]. The explanatory target is the organization of biological work within the bounded system.

The physical problem can now be stated more precisely. A living organism must continually preserve gradients and regulatory distinctions against leakage and decay. It must remain sensitive enough to register consequential change without reacting indiscriminately to every fluctuation. It must permit selected disturbances to persist and propagate without allowing them to destabilize the whole system. It must coordinate local changes with wider organismic conditions, support threshold-dependent transformation, and restore sufficient organization for continuing biological availability [24, 32, 77–79, 90, 91, 108].

No single molecular mechanism performs all of these operations, and no central anatomical engine supervises them from outside the process. They arise through distributed, energy-dependent coordination among established biological systems operating under continual variability, finite resources, and changing environmental demand [24, 32–35, 90, 91, 108].

The term Stochastic Pump is introduced to name the proposed systems-level organization of that distributed biological work.

6.2 Definition and Status of the Stochastic Pump

The term Stochastic Pump denotes the proposed systems-level organization of distributed, energy-dependent biological work through which a living system continually maintains, recruits, permits controlled perturbation of, coordinates, and restores the nonequilibrium gradients and regulatory conditions required for bounded organism-relative state-transitions under ongoing noise, leakage, finite resources, and environmental disturbance.

The construct therefore does not designate a single anatomical structure, molecular pump, biochemical pathway, or previously undiscovered mechanism. Its proposed physical implementation consists entirely of established biological processes whose coordinated activity maintains the physical conditions from which bounded organism-relative events can develop and is selectively recruited as those events unfold and resolve [24, 32–35, 77–82, 90, 91, 109].

Depending upon the organism and the event, these processes may include ion pumps and channels, metabolic pathways, active transport, calcium regulation, vascular or hydraulic support, chemical signalling, autonomic and endocrine regulation, fluid movement, mechanical preparation, feedback control, and restoration of electrochemical and molecular gradients [24, 32–35, 77–82, 90, 91, 109]. The Stochastic Pump does not replace these mechanisms with a new causal entity. It identifies the distributed functional organization through which they collectively maintain, recruit, and restore the living system.

This distinction is essential because the word pump ordinarily suggests a discrete machine. Molecular pumps occupy membranes and move particular substances through defined biochemical cycles. Sodium–potassium ATPase, proton-pumping ATPases, calcium pumps, and other active transporters are pumps in this literal molecular sense [78, 82, 90]. They are among the mechanisms that may participate in the proposed systems-level organization, but they do not constitute it by themselves. The wider organization also includes metabolic supply, channels, exchangers, and cotransporters that mediate selective ion flux, signalling processes that coordinate recruitment, vascular or hydraulic systems that support transport and resource distribution, and regulatory processes that restore functional availability.

The concept is comparable in level, though not in mechanism, to circulation. Circulation is not an additional organ hidden behind the heart and vessels. It is the organized process produced through the coordinated activity of the heart, blood, vascular system, respiratory exchange, neural regulation, pressure gradients, and tissue demand. It is physically real and empirically measurable even though it cannot be localized to one molecule or structure. The Stochastic Pump is proposed at a similar systems level. Its validity does not depend upon finding one structure that bears its name, but upon whether established biological components exhibit the coordinated maintenance-and-restoration relation described by the construct.

The concept must therefore remain biologically decomposable. Every proposed contribution should be traceable to identifiable physical operations. Gradient maintenance can be investigated through membrane potentials, ion distributions, transporter activity, and ATP-dependent pumping. Metabolic support can be investigated through respiration, substrate and oxygen delivery, ATP production, and resource allocation. Signal coordination can be examined through electrical, chemical, calcium-related, neural, autonomic, or hormonal activity. Mechanical and fluid preparation can be examined through pressure, tissue tension, vascular condition, hydraulic state, and regulated movement of water or solutes. Restoration can be examined through repolarization, calcium removal, transmitter recycling, metabolite clearance, reopening, recovery of excitability, and renewed physiological or behavioural availability [24, 33–35, 77–82, 86, 90, 91, 109].

The systems-level term is justified only insofar as these operations form a coordinated process. It must not become a label placed over unexplained biology. Its explanatory value lies in identifying a recurrent functional relation among mechanisms that can already be studied separately: registration, persistence, integration, commitment, and resolution are not self-supporting operations. Each depends upon a living system that continually produces, recruits, and repairs the physical conditions required for the event to occur.

The description energy-dependent is equally important. Living systems cannot preserve electrochemical, molecular, hydraulic, mechanical, and regulatory differences without free-energy throughput. ATP hydrolysis, respiration, photosynthesis, substrate delivery, active transport, and associated processes provide the work through which gradients and functional states are maintained [32–35, 78, 79, 90]. The Stochastic Pump therefore cannot operate independently of metabolism.

It should not, however, be equated with metabolism in its broadest sense. Metabolism includes the full network of transformations through which organisms acquire, convert, store, and use energy and material [32, 35]. Much of this activity does not participate directly in any particular bounded organism-relative event. The Stochastic Pump refers more narrowly to the organization of energy-dependent processes around the maintenance, recruitment, controlled disturbance, coordination, and restoration of the conditions required for such an event.

The same metabolic pathway can support growth, repair, secretion, digestion, movement, thermoregulation, or sensory processing. Its relevance to the Stochastic Pump depends upon the event organization into which it is recruited. Increased respiration, for example, establishes that biological work has changed but does not by itself reveal whether that work supports trap closure, tissue repair, digestion, or another function [32–35, 42, 79]. The Pump is therefore defined by the organization of biological work rather than by its magnitude. Energy enables physical change; it does not independently specify registration, persistence, integration, valuation, or resolution.

The term distributed indicates that the relevant work is performed across interacting components and scales. At molecular and cellular levels, ATPases, channels, exchangers, receptors, enzymes, signalling molecules, and metabolic pathways perform identifiable operations. At tissue levels, populations of cells coordinate electrical, chemical, metabolic, hydraulic, vascular, mechanical, or secretory activity. At the organismal level, resource supply, autonomic regulation, endocrine condition, behaviour, and environmental interaction constrain what can be maintained and recruited [24, 32–35, 77, 78, 82, 90, 91].

The Stochastic Pump becomes identifiable when these levels are considered as a causally coordinated process. This does not mean that an additional substance emerges. It means that the complete functional relation cannot be captured by naming any one component. An ion pump can restore part of a gradient but cannot maintain the organism's complete readiness. A blood vessel can deliver oxygen and glucose but cannot determine how those resources are recruited across an event. A neural circuit can integrate signals but cannot continue operating without metabolic, vascular, glial, and bodily support. A hydraulic process can contribute to plant movement but cannot explain electrical registration, persistence, hormonal coordination, or later reopening [24, 33–35, 65, 77–82, 86, 90, 91, 109].

The word continually must also be interpreted carefully. The Stochastic Pump does not operate at one uniform rate. Living systems require ongoing support, but the relative recruitment of particular components changes with circumstance [24, 32–35]. Some processes preserve baseline readiness. Others become prominent during registration and integration. Others support commitment, mechanical action, behaviour, or autonomic mobilization. Still others dominate during recovery.

A resting system is therefore not physically inactive, but its baseline maintenance is not identical to event-specific recruitment. The Stochastic Pump includes both the continuing work required to preserve biological availability and the additional or redistributed work required when that availability is organized into a bounded transition.

This distinction is visible in the flytrap. Before stimulation, active transport, membrane regulation, tissue hydration, structural maintenance, stored elastic energy, and metabolic supply preserve an open, excitable, and mechanically primed trap. During stimulation, electrical and calcium-related signalling recruit part of that maintained capacity. When the relevant transition condition is reached, rapid epidermal cell-wall softening releases stored elastic energy and permits snap-through; broader water and solute regulation remains relevant to physiological preparation and later recovery rather than serving as the immediate motor of the rapid snap. Continued stimulation may recruit sealing, hormonal signalling, glandular activity, and digestion. Repolarization, calcium regulation, resource replenishment, broader physiological reorganization, and reopening later contribute to renewed availability [65, 66, 76–89]. The components and their relative contributions change, but continuity of maintenance and restoration spans the sequence.

Human implementation is substantially more differentiated. Baseline neural excitability, synaptic availability, metabolic supply, vascular regulation, glial support, autonomic organization, and bodily condition establish the physical capacity for an event. A disturbance then recruits selected sensory, neural, vascular, metabolic, autonomic, muscular, mnemonic, and behavioural processes. The resulting changes alter the condition inherited by subsequent processing. Restoration may include ion redistribution, transmitter recycling, vascular adjustment, autonomic settling, metabolic replenishment, attentional reorganization, and renewed behavioural availability [12, 13, 21–24, 33–35, 42, 90, 91, 96, 109]. No one mechanism remains dominant throughout. The Pump is defined by continuity of function, not constancy of implementation.

The inclusion of controlled perturbation in the definition is deliberate. The Stochastic Pump does not merely oppose change or maintain variables at fixed values. Living systems must permit controlled departures from prior conditions in order to register and respond. Electrical signalling requires temporary changes in membrane potential. Calcium signalling requires regulated movement away from resting concentrations. Muscular and hydraulic action require changes in pressure, tension, or fluid distribution. Vascular support requires redistribution of blood flow, and autonomic mobilization requires temporary alteration of bodily regulation [24, 77, 78, 82, 90–92].

The system remains organized not by preventing every change, but by regulating which variables may change, how far and how long they may depart, how those changes interact, and how they are later contained or incorporated. The Stochastic Pump maintains the capacity for perturbation, supports perturbation while it remains functionally organized, and contributes to the restoration or reorganization that follows.

Coordination refers to the relation among these simultaneous demands. Some variables must remain within viable ranges while others change rapidly. Electrical excitability must remain available while selected membranes depolarize. Metabolic resources

must be delivered while local activity increases. Commitment must occur without catastrophic loss of systemic regulation. Persistent traces must remain active long enough to affect later processing while irrelevant or destabilizing changes are removed.

This organization need not be directed by one central controller. It can arise through local feedback, distributed signalling, network dynamics, vascular or hydraulic coupling, structural constraints, and evolved regulatory relations. The absence of a central supervisor is not the absence of coordination.

The term stochastic identifies the physical conditions under which this organization operates. Biological systems consist of finite numbers of interacting components subject to thermal fluctuation, probabilistic channel behaviour, variable binding, diffusion, chemical noise, leakage, degradation, changing resource availability, and irregular environmental input. Living systems must preserve reliable function despite this variability [32, 108].

Stochastic does not mean unorganized randomness, nor does it imply that randomness generates phenomenology. The term indicates that biological maintenance and regulation occur within unavoidable variability rather than within a perfectly controlled mechanical environment. The Pump preserves functional distinctions through this variability. It sustains membrane potentials despite leakage, maintains calcium separation despite diffusion and repeated signalling, preserves tissue readiness despite turnover and changing hydration, and restores sufficient organization after disturbance without eliminating every fluctuation [32, 77, 78, 82, 108].

This usage must also be distinguished from narrower meanings of stochastic pump in statistical physics and stochastic thermodynamics. In those contexts, the phrase can refer to defined systems in which fluctuations or time-dependent parameter changes produce directed transport [110]. The capitalized term Stochastic Pump is broader and specifically biological. It does not claim that one established stochastic-pumping formalism governs the complete organism-relative event. Its validity depends upon biological decomposition and empirical coordination, not upon terminological resemblance to a particular mathematical model.

The ontological claim associated with the construct should therefore remain limited. The Stochastic Pump is not a substance, additional force, internal observer, reservoir of consciousness, special form of heat, or newly discovered molecular object. It is a proposed process-level description of the coordinated way established biological mechanisms sustain and restore the physical conditions required for bounded organism-relative state-transitions.

The underlying mechanisms and physical work are independently established biological realities. Whether their coordinated relation warrants treatment as a distinct systems-level construct comparable in explanatory status to circulation, inflammation, development, or digestion is an empirical question. That status would be earned insofar as the proposed organization can be biologically decomposed, measured, perturbed, and shown to provide causal or predictive value beyond a list of its components.

The construct also differs from homeostasis. Homeostasis generally concerns the regulation of biological variables within viable ranges [24]. That function contributes to the Pump, but bounded events often require temporary departures from prior conditions, redistribution of resources, threshold crossing, and commitment to altered states. The Pump supports both stability and controlled transformation. It preserves the system's capacity to change without losing organized continuity.

Allostasis is similarly relevant because organisms often regulate by responding to, preparing for, or anticipating changing demands rather than returning every variable to one fixed set point. In humans, attention, expectation, memory, threat, and projected futures can recruit physiological support before an anticipated outcome occurs [12, 13, 21, 22, 24]. Homeostatic and allostatic processes can therefore contribute to the Stochastic Pump where they support readiness, event recruitment, coordination, or resolution. The term does not replace either concept; it identifies how they participate within the wider event-supporting architecture.

The Stochastic Pump must also remain distinct from the bounded organism-relative event. The two overlap causally but occupy different levels of description. The Pump names the distributed work that maintains and restores the relevant physical conditions and is selectively recruited during an event. The bounded event is the particular state-transition in which those maintained conditions are organized around a consequential disturbance.

The Pump can remain active between events and supports many biological processes that are not complete mapped events. During a bounded transition, its work becomes part of the Grind because it implements and sustains the event. It is not, however, identical to the entire Grind. The event additionally includes the particular registration, retained history, integration, organism-relative valuation, commitment, transformation, and resolution organized around the disturbance.

The Stochastic Pump implements and sustains the mapped event; it is not by itself the mapped event.

The same separation applies to the Friction Signatures. The Stochastic Pump is the distributed process. Friction Signatures are measurable exterior changes associated with its recruitment. Electrical activity, calcium dynamics, respiration, photosynthetic alteration, hydraulic change, blood flow, glucose or oxygen use, electrophysiological activity, functional connectivity, autonomic change, heat production, and recovery dynamics may each provide partial access to aspects of the process [16, 21, 33–35, 38–44, 79, 90, 91].

None constitutes the Stochastic Pump independently. Their interpretation depends upon timing, location, functional role, and convergence with the developing event. Metabolic elevation may reflect unrelated work. Electrical activity may remain local or functionally incomplete. Autonomic activation may arise under several conditions [21, 24, 32–35, 42, 79]. The empirical target is therefore a coordinated event-relative profile, not one universal marker.

The distinction also extends to the Glow. The framework does not propose that the Stochastic Pump manufactures phenomenology as a separate product. Such a formulation would place a physical cause on one side and an unexplained phenomenal effect on the other, reproducing the explanatory gap.

The mature formulation is different. The Stochastic Pump contributes to the physical implementation of the bounded organism-relative event. The Glow is proposed as the organism-relative inside view of that complete event. The Pump is necessary insofar as the gradients, regulatory conditions, and restorative capacities required by the event cannot otherwise be sustained. Pump activity alone is not sufficient to establish the Glow.

The levels of description can therefore be ordered clearly. Molecular, cellular, tissue, and organismic mechanisms perform identifiable physical work. Their coordinated maintenance, recruitment, perturbation, and restoration constitute the Stochastic Pump. The bounded organism-relative event is the particular transition organized around a consequential disturbance. Friction Signatures are measurable exterior traces associated with the work required to sustain and resolve that transition. The Glow is the proposed organism-relative inside view of the complete event.

These are not separate substances or interchangeable names. They distinguish physical component, systems-level process, bounded event, empirical access, and organism-relative aspect. Collapsing these levels would confuse molecular mechanisms with their coordination, the Pump with the complete event, measurement with process, metabolic consequences with the Glow, or the Glow with an additional product generated after the event.

The Stochastic Pump should therefore be evaluated as a systems-level biological hypothesis. Its value depends upon whether it organizes established mechanisms into a coherent causal account of readiness, controlled transformation, and restoration; whether it supports comparison across biological substrates without requiring identical implementation; and whether it generates distinguishable expectations when maintenance, recruitment, coordination, or recovery are disrupted.

The construct must remain revisable. Different organisms and events may recruit different maintenance architectures. Processes central to one transition may be peripheral to another, and the boundaries of the systems-level relation may require refinement as empirical evidence becomes more precise. The concept earns its place not by resisting decomposition, but by directing it.

Its formal status can therefore be summarized as follows. The Stochastic Pump is a systems-level biological hypothesis concerning the coordinated organization of established energy-dependent processes that sustain and restore the physical conditions required for bounded organism-relative state-transitions. It posits no new molecule, force, anatomical controller, or consciousness-generating substance. Its scientific value depends upon biological decomposability, measurable coordination, perturbational vulnerability, and explanatory or predictive gain beyond the component mechanisms considered separately.

6.3 Biological Components and Physical Implementation

The biological work described by the proposed Stochastic Pump organization is carried out through established biological mechanisms. The construct introduces neither a new molecule nor an unknown form of energy. Its proposed contribution lies in identifying the systems-level relation that may be present when familiar mechanisms collectively maintain, recruit, coordinate, and restore the physical conditions required for bounded organism-relative events.

For analytical purposes, its implementation can be organized around several overlapping functions: maintenance of gradients and electrical readiness; production and delivery of usable energy; propagation and coordination of signals; regulation of mechanical and fluid conditions; chemical and regulatory control; and restoration, clearance, and renewed availability. These categories are not mutually exclusive. A proton pump can contribute to membrane potential, solute transport, pH regulation, and later recovery. Calcium can participate in electrical signalling, secretion, contraction, gene regulation, and longer-lasting state change. Vascular or hydraulic processes can distribute resources, alter pressure, support movement, and remove metabolic products [24, 32–35, 77, 78, 82, 90, 91, 109].

The purpose of the categories is therefore not to assign each mechanism one exclusive role. It is to show how different physical operations combine within the broader maintenance-and-restoration architecture.

Electrical and chemical responsiveness first depend upon the active preservation of unequal distributions of matter. Ions must remain concentrated differently across membranes, electrical charge must remain separated, and calcium must be maintained at markedly different concentrations in the cytoplasm, extracellular environment, and intracellular stores. Proton, potassium, sodium, chloride, calcium, and other ion distributions must be regulated sufficiently to preserve membrane potential, osmotic balance, pH, signalling capacity, and excitability [32, 82, 90, 91, 111].

These differences are continually eroded by diffusion, leakage, and repeated signalling. Active transport is therefore required to establish and restore many of the gradients upon which electrical and chemical responsiveness depends. Molecular pumps use metabolic energy to move ions against electrochemical gradients, while channels, exchangers, and cotransporters mediate selective ion movement according to their gating, transport properties, and prevailing gradients. Electrical signalling does not receive all of its physical support at the instant a channel opens. It draws upon gradients created and maintained through prior biological work [32, 78, 82, 90, 91, 111].

In the Venus flytrap, proton-pumping ATPases contribute to the resting membrane potential and energize transmembrane transport. Calcium-permeable channels, anion channels, potassium channels, proton pumps, and associated transporters contribute to different phases of the electrical and calcium-related event. Mechanical stimulation recruits this prepared condition.

Selected conductances contribute to depolarization and propagation, while potassium channels, proton pumps, and active transport contribute to repolarization and renewed excitability [77, 78].

These mechanisms do not constitute neural computation in plant form. They instantiate the more general physical relation through which an excitable tissue establishes gradients, permits controlled disturbance, and restores functional readiness.

Human neural excitability is implemented through different molecular arrangements. Sodium–potassium ATPases, calcium pumps, exchangers, chloride transporters, buffering proteins, intracellular stores, mitochondria, and numerous voltage- and receptor-operated channels contribute to neuronal and glial membrane conditions. Sodium and potassium gradients support resting potential, action-potential generation, secondary transport, and recovery. Calcium handling permits brief and spatially organized transients while preventing uncontrolled cytosolic accumulation. Chloride regulation contributes to inhibitory signalling, while glial cells help regulate extracellular potassium, neurotransmitter concentrations, water balance, and the chemical environment in which neural activity occurs [33–35, 82, 90, 91, 111].

The cellular and network differentiation is far greater than in the flytrap, but the general requirement remains the same: electrochemical differences must be actively preserved before they can be recruited into signalling.

Ion channels alone do not maintain this readiness. A channel generally permits movement through an existing gradient. Its effect depends upon the gradient already being present, the membrane in which it is expressed, its timing, and the other conductances active within the same event. The Stochastic Pump therefore includes the coordination between processes that establish gradients and those that permit their controlled use. It is located neither in the pump nor in the channel considered separately.

This maintenance requires usable energy. ATP supports active transport, molecular synthesis, repair, transmitter recycling, calcium regulation, secretion, and mechanical work [33–35, 42, 90–92]. ATP is not an explanation of the event stored in molecular form. It is an energetic currency through which particular reactions become physically possible. Its significance depends upon where, when, and for what function it is used.

In plant tissue, respiration supplies ATP for active transport, regulation, synthesis, secretion, resource restoration, and other cellular work. Photosynthesis supplies chemical energy to the organism over broader timescales, while respiration makes usable energy available to cellular processes. The flytrap capture sequence illustrates that electrical signalling and mechanical commitment are accompanied by changes in resource use. Stimulation and closure can alter respiration and photosynthetic performance, while continued prey movement, sealing, secretion, digestion, and later recovery recruit additional regulatory and biosynthetic work [65, 79, 81, 87–89].

These changes do not establish that metabolic expenditure is the event. They show that the event recruits work extending beyond the visible snap.

Animal neural systems similarly depend upon continuous energy production and resource delivery. Repeated electrical signalling disturbs ion gradients that must be restored. Synaptic transmission requires transmitter release, vesicle cycling, and molecular recycling. Cellular integrity must be maintained despite sustained activity. Glial cells participate in metabolic support, transmitter handling, extracellular regulation, and interaction with the vasculature. Blood flow delivers oxygen and metabolic substrates while contributing to the removal of carbon dioxide, heat, and other products [33–35, 42, 90, 91, 109, 111].

Vascular support is therefore not merely a passive after-effect of neural activity. It forms part of the physical architecture that permits activity to continue within viable limits. This point also constrains interpretation of measurement. Changes in blood flow or blood-oxygen-level-dependent signals provide indirect evidence of altered neural and vascular recruitment [33–35, 112]. They do not directly measure total ATP turnover, heat production, or the complete energetic cost of an event [33–35, 42, 112]. The Pump must therefore be investigated through convergent measurements rather than identified with one haemodynamic variable.

Resource support also extends beyond the immediately active tissue. Respiration supplies oxygen, circulation distributes substrates and heat, autonomic regulation alters breathing and vascular tone, and endocrine processes redistribute resources over longer periods. Hydration, temperature, nutritional condition, illness, prior exertion, and pharmacological state constrain what the organism can presently sustain. Neural events occur within a wider biological economy whose resources are finite and whose regulatory priorities can change [24, 33–35, 42].

The same disturbance can consequently produce a different event when the organism is hypoxic, exhausted, overheated, dehydrated, injured, or metabolically compromised. The maintained support conditions have changed [24, 33–35, 42].

Registration must also become available beyond its initial site if it is to participate in a wider transition. Signal propagation performs this function, but no single signal contains the complete event.

In the flytrap, electrical activity and calcium-related changes spread from the trigger-hair region across the excitable trap. Continued stimulation can recruit hormonal signalling, glandular activity, secretion, and nutrient acquisition. Electrical signals provide rapid propagation; calcium-related states can preserve consequences across longer intervals; chemical pathways recruit slower downstream changes; and mechanical transformation recruits a structure prepared through prior biological work, with broader water- and solute-regulatory processes contributing to the wider physiological cycle rather than serving as the immediate motor of the rapid snap. The capture event is coordinated through processes operating at different speeds and spatial scales [65, 66, 77, 80, 81, 84–89].

Human coordination is more extensively differentiated. Sensory receptors produce electrical or chemical changes that enter neural pathways. Action potentials enable rapid transmission over distance. Synaptic activity changes communication among cells. Recurrent connections allow later activity to influence earlier or parallel processing. Neuromodulators alter excitability,

attention, motivation, learning, and network state. Glial signalling and extracellular regulation modify the conditions under which neurons operate. Thalamic, cortical, subcortical, cerebellar, brainstem, autonomic, and bodily systems may all contribute to one developing event [24, 64, 68, 90, 91, 95, 103, 106, 111].

The Stochastic Pump does not designate the informational or phenomenal content carried by these systems. It designates the distributed physical support through which their signalling remains possible, coordinated, and recoverable. A neural organization supporting colour, pain, sound, or bodily perception depends upon specialized receptors, pathways, network dynamics, and retained history. The Pump sustains those organizations but does not independently determine their content.

Coordination also requires selectivity. Every fluctuation cannot propagate without constraint. Receptors possess sensitivity ranges; channels have activation and inactivation properties; synapses differ in strength; inhibition limits spread; thresholds influence whether activity remains local or recruits a wider transition; and feedback alters the gain of later processing. The maintenance system must support both propagation and containment. It must permit biologically relevant change to spread while preventing uncontrolled excitation from erasing functional distinctions [64, 90, 91, 103, 108, 111].

The flytrap exhibits the same general problem in a more restricted form. Appropriate trigger-hair displacement can initiate propagation, whereas insufficient or poorly timed stimulation may fail to recruit closure. In humans, sensory activity may be amplified, suppressed, redirected, or denied wider access according to attention, arousal, inhibition, competition, and prior state. The mechanisms differ, but both systems must remain sensitive without becoming indiscriminately reactive [56, 57, 64, 66, 68, 77, 80].

Biological implementation is not exclusively electrical or chemical. Living systems possess mass, pressure, tension, geometry, viscosity, and mechanical constraint. Signals become organismically consequential partly by reorganizing these physical relations.

The flytrap is mechanically prepared before stimulation. Its lobes possess a particular geometry, curvature relation, tissue stress, material organization, and stored elastic energy. Recent in-situ hydraulic and mechanical measurements indicate that the rapid snap itself is too fast to be driven by water transport. Instead, rapid softening of the epidermal cell wall releases stored elastic energy, allowing the prepared lobe structure to cross its mechanical instability and undergo snap-through. The initiating disturbance therefore does not generate the force of closure from an unprepared state; it recruits a mechanically loaded biological structure whose relevant conditions existed beforehand [84, 85].

Water transport, osmotic regulation, tissue hydration, metabolism, and broader mechanical organization remain important to the physiological preparation and continuing capture cycle, including sealing, later regulation, recovery, and reopening [79, 81, 86]. Their involvement across the wider event should not be conflated with the immediate motor of the rapid snap. The capture sequence therefore illustrates why causal roles must remain differentiated even when several physiological systems contribute to the complete bounded transition.

Animal movement is implemented through different tissues but shows the same interdependence. Muscle contraction requires membrane excitability, calcium regulation, actin–myosin interaction, ATP supply, connective organization, and biomechanical geometry [92]. Vascular smooth muscle alters blood flow, respiratory muscles regulate gas exchange, and autonomic changes reorganize the mechanical and fluid condition of the body [24, 92]. Sensory events may prepare posture, orient the head or eyes, alter muscle tone, or initiate withdrawal before explicit recognition or report [27, 68].

Even when overt movement does not occur, bodily readiness can change. Fear may alter respiration, cardiac activity, vascular tone, and muscular tension. Pain can reorganize posture and protective action. Attention can alter eye movements and sensory sampling [12, 13, 21, 27, 68]. Human organism-relative events are therefore implemented partly through the body they prepare to act.

Fluid regulation also operates within the nervous system. Blood and cerebrospinal fluid contribute to delivery, pressure regulation, heat exchange, and waste movement. Cells regulate water and volume through ion transport and osmotic control. Glial and vascular processes help stabilize the extracellular environment [33–35, 109, 111]. These operations are not usually experienced as separate components of perception, but they are physically necessary for the event to remain viable.

Chemical signalling extends coordination across longer timescales. Electrical propagation can communicate rapidly, whereas chemical messengers alter excitability, secretion, metabolism, gene expression, inflammation, tissue sensitivity, and future response. Their consequences may persist after the fastest electrical phase has ended [24, 82, 91, 94].

In the flytrap, continued mechanical stimulation can recruit hormonal signalling and digestion. The response therefore develops beyond closure. Electrical activity helps distribute the initial disturbance, while slower chemical pathways reorganize the trap for retention, secretion, digestion, and nutrient uptake [65, 81, 87–89].

In humans, neurotransmitters and neuromodulators influence local transmission and distributed network state. Hormonal, autonomic, and immune signals alter organism-wide readiness. Stress-related signalling can prolong physiological mobilization after the original disturbance is absent. Fast transmission permits immediate coordination, neuromodulation changes the conditions of subsequent processing, and transcriptional or structural effects can alter later events over substantially longer intervals [12, 13, 21, 22, 24, 91, 94].

The Stochastic Pump includes these processes only where they contribute to the maintenance, recruitment, coordination, or restoration of the bounded organization. It is not identical to every chemical change occurring within the organism.

Regulatory feedback enables the system to adjust its own activity without requiring a central observer. Departures from viable conditions alter receptors, molecular interactions, transport, metabolism, secretion, circulation, or behaviour. The resulting changes then modify the conditions driving the regulatory response. Such organization can be local, distributed, nested, and anticipatory [24, 32]. Memory and expectation may mobilize human autonomic and metabolic support before a predicted demand occurs [9, 10, 12, 13, 21, 22, 24]. In the flytrap, maintained readiness and threshold architecture permit rapid recruitment when an appropriate mechanical sequence is encountered [66, 77, 80]. The mechanisms and temporal reach differ, but in both cases regulation depends upon causal interaction among physical components.

Bounded events can leave altered conditions that must be restored, cleared, incorporated, or otherwise reorganized. Where continued viability and repeatable responsiveness are possible, a system incapable of sufficient recovery would progressively lose the capacity for subsequent events. Restoration is therefore integral to repeatable biological organization, while resolution of a particular event does not require exact return to the condition that preceded it.

Electrical recovery requires repolarization and renewed ion gradients. Calcium must be buffered, exchanged, pumped, or returned to stores. Neurotransmitters must be degraded, removed, or recycled. Vesicles and metabolic substrates must be replenished. Reactive products and heat must be managed. Water and solute distributions must be regulated, and mechanical structures must regain sufficient readiness for later action [33–35, 78, 82, 90, 91, 109, 111].

These variables recover over different timescales. In the flytrap, electrical conditions can begin recovering while calcium-related, metabolic, hydraulic, and mechanical changes remain active. Reopening requires more time than electrical repolarization, and digestion may extend the transition for days. No single moment marks the return of every variable to baseline [65, 77–81, 86].

Human recovery is similarly layered. Action potentials end rapidly, but ion-pump work continues. Synaptic and intracellular conditions may remain altered. Vascular and autonomic responses can outlast local neural activity, and hormonal effects may extend recovery further. Memory and plasticity preserve selected consequences after immediate regulation has stabilized [12, 13, 24, 33–35, 90, 91, 94, 96]. Resolution therefore restores sufficient organization for continuing function without erasing every trace of the event.

Clearance and replacement extend this architecture beyond the initially active tissue. Metabolic activity produces carbon dioxide, heat, altered redox conditions, and other products that must be managed. Neural activity alters extracellular ion and transmitter concentrations. Blood flow, glial transport, respiration, fluid exchange, enzymatic breakdown, and organismal elimination contribute at different scales. Proteins, membranes, receptors, and transporters also undergo damage and turnover and must be synthesized, repaired, or replaced [32–35, 90, 91, 109, 111].

Some of this background work is too slow or general to belong uniquely to one bounded event, but it preserves the capacity for repeated events. The Stochastic Pump therefore has both immediate and background implementation. Immediate implementation concerns the processes recruited within a particular transition. Background implementation concerns the slower maintenance through which participating tissues remain capable of future recruitment. The event requires prior readiness, while continued organismic availability requires later restoration and renewal.

These mechanisms operate across several levels simultaneously. A membrane channel changes ion flow; altered ion flow changes cellular electrical or chemical state; populations of cells alter tissue activity; tissue activity changes metabolic demand, fluid movement, circulation, or mechanics; and those changes modify the condition of the wider organism. The altered organismic state then feeds back upon cellular responsiveness [24, 32–35, 90, 91, 111].

This cross-level organization does not violate molecular explanation. Higher-level conditions constrain which molecular mechanisms are recruited, where they operate, and how their consequences combine. Molecular events remain indispensable, but none independently determines the complete organism-relative transition.

Opening one channel is not trap closure. One action potential is not digestion. One calcium transient is not the capture event. The flytrap transition arises through relations among receptor mechanics, electrical propagation, calcium-related persistence, threshold integration, mechanical snap-through, broader ion- and water-regulatory processes, hormonal signalling, metabolic recruitment, and restoration [65, 66, 76–89].

The same methodological rule applies in humans. One neuron is not a percept. One cortical activation is not the complete organism-relative event. One increase in blood flow is not the Stochastic Pump, and one autonomic marker does not identify the complete event or the organism-relative organization it supports [30, 64, 112]. Each measurement provides access to a component or consequence within a wider biological organization.

Implementation must therefore be studied through coordinated, event-relative patterns. The framework predicts no single molecular signature that will appear identically in every bounded event or every organism. Different substrates use different transporters, tissues, signalling pathways, and support systems. The commonality lies in the physical work performed: gradients are maintained, resources are supplied, signals are propagated and constrained, mechanical and bodily conditions are coordinated, disturbances are resolved or incorporated, and future availability is preserved or reorganized where continued viability permits [24, 32–35, 65, 77–82, 86, 90–92, 109, 111].

This functional continuity does not erase biological specificity. The participating mechanisms determine what kinds of events an organism can instantiate. Plant electrical, hormonal, hydraulic, and mechanical systems support a specialized capture transition. Neural, glial, vascular, autonomic, endocrine, and muscular systems support the highly differentiated events possible in humans [24, 33–35, 65, 77–82, 90–92, 109, 111]. The Stochastic Pump is therefore substrate-dependent in implementation while remaining comparable at the level of systems function.

A component account does not by itself establish phenomenology. Ion pumps operate in tissues that are not undergoing complete mapped events. Metabolism supports all living cells. Calcium signalling occurs in many contexts. Blood flow changes for reasons unrelated to phenomenology, and mechanical work can occur without differentiated integration [32–35, 42, 82, 90, 112]. The presence or accumulation of these mechanisms is therefore insufficient to satisfy the identity proposition.

Their relevance depends upon how they are recruited into the bounded organism-relative transition. The components must not be treated as pieces from which consciousness is assembled by simple addition. No quantity of ATP, calcium, electrical activity, vascular flow, or regulatory feedback produces the Glow merely through accumulation.

The Pump supports the Grind by maintaining, recruiting, and restoring its physical conditions. The complete Grind additionally includes the particular registration, persistence, integration, organism-relative valuation, transformation, and resolution of the disturbance. Biological implementation is therefore distributed and event-specific. A broadly similar maintenance architecture can support many possible events, while each event recruits a distinctive subset and temporal pattern of that architecture.

The decisive question is not which molecule constitutes the Stochastic Pump. It is how established mechanisms cooperate before, during, and after a bounded transition to preserve organized continuity under disturbance.

6.4 Role Across the Bounded State-Transition

The biological work described by the Stochastic Pump does not begin only after a disturbance has occurred. The proposed systems-level organization extends across the complete bounded organism-relative transition: it preserves the conditions from which selective registration can occur, is differentially recruited as the event develops, supports the controlled departures required for transformation, and contributes to the restoration or reorganization that follows.

Its role is therefore temporal as well as structural. The mechanisms implementing the Pump do not remain fixed in one operating state. Their relative contributions change as the organism moves through readiness, registration, persistence, integration, commitment, transformation, and resolution. The Pump provides continuity across these phases without requiring uniform activity or a single dominant mechanism.

Several phases may overlap. Gradient restoration can begin while signalling remains active. Metabolic and vascular support can change before an externally visible response occurs. Mechanical commitment may develop while electrical and chemical signalling continue. Some variables recover rapidly, whereas others remain altered long after the initiating disturbance has ended [33–35, 77–81, 86, 90, 91, 112]. The bounded event is therefore not a succession of sealed stages. It is a coordinated transition in which the condition produced by each phase becomes part of the physical context encountered by the next.

Before event-specific recruitment begins, the organism must preserve the capacity for the relevant transition to occur. This requires more than remaining alive in a general sense. Appropriate receptors must remain responsive, electrochemical gradients must be maintained, signalling pathways must remain functionally connected, and metabolic resources must remain available. Mechanical, hydraulic, vascular, and bodily conditions must also remain within ranges compatible with coordinated response. Regulatory processes must preserve sufficient stability for a consequential disturbance to be distinguished from background fluctuation [24, 32–35, 77, 78, 82, 90–92, 111].

The Stochastic Pump maintains this field of biological possibility. It does not determine in advance which event will occur, but it constrains which events remain physically available to the organism.

In the Venus flytrap, the open trap must already be electrically excitable, mechanically prepared, hydraulically organized, and metabolically supported before a trigger hair is displaced. Its resting membrane potential, ion distributions, calcium separation, tissue geometry, water relations, and structural readiness are maintained in advance. Mechanical stimulation does not create this capacity. It recruits a condition produced through prior and continuing biological work [76–86].

The same principle applies in the human organism. A visual event depends upon responsive retinal receptors, maintained neural gradients, transmissive synapses, and metabolic and vascular systems capable of supporting changing demand. A nociceptive event initiated by peripheral stimulation depends upon available transduction and conducting pathways together with central and organismic systems capable of processing the disturbance. A remembered event depends upon preserved neural architecture, retained biological history, metabolic support, and renewed access to earlier biological consequences [27, 29, 33–35, 42, 64, 90, 91, 96, 106].

Readiness is therefore not an empty interval between events. It is the actively maintained range of possible transitions from which a particular event can develop.

When a qualifying disturbance occurs, the Stochastic Pump is not added to an otherwise independent act of registration. The disturbance recruits the organism's maintained conditions into a particular transition. Receptors change state, channels open or close, ion movement alters local electrical and chemical conditions, and intracellular signalling begins. The resulting alteration may be amplified, propagated, contained, or allowed to decay according to the organization and current condition of the system.

Registration consequently depends upon both the disturbance and the organism into which it enters. Similar mechanical displacement can produce different consequences in a mature flytrap, an immature trap, a metabolically impaired trap, or one whose excitability has been disrupted. The external movement may be comparable while the biological event differs because the maintained conditions of registration differ [77, 79–81, 83, 113].

The Pump contributes to registration by preserving the distinctions through which selective response becomes possible. A membrane potential permits ion movement to produce a consequential electrical change. Calcium separation permits a transient

increase to function as a signal. Receptor sensitivity distinguishes qualifying stimulation from inadequate disturbance. Threshold properties constrain whether an alteration remains local or recruits a wider transition [66, 77, 78, 82, 90, 91].

Human registration is affected by an even wider range of maintained conditions. The consequences of a sound, image, touch, or internal bodily change depend upon receptor sensitivity, arousal, attention, previous activity, metabolic state, injury, medication, and competition from ongoing processes [22–24, 33–35, 42, 56, 64, 90, 91]. The Pump does not provide the sensory content. It maintains and recruits the physical organization through which that content can become part of an organism-relative event.

For a disturbance to influence what happens next, some part of its consequence must persist. Persistence requires a regulated imbalance. The trace cannot disappear immediately, but neither can it remain indefinitely active without constraint. The Stochastic Pump supports both sides of this relation: it sustains the conditions through which a transient alteration remains consequential and recruits the regulatory processes through which that alteration is eventually limited, incorporated, or removed.

In the flytrap, a qualifying stimulation leaves a physiological consequence that outlasts the initial mechanical contact. Electrical and calcium-related changes establish a finite interval during which a later stimulation encounters a trap that has already been altered. The second disturbance therefore does not enter the same system state encountered by the first. The retained consequence changes what the later disturbance can do [66, 77].

This is the physical basis of temporal integration. The Pump supports the processes through which the initial consequence persists while also contributing to the gradual restoration through which its influence eventually declines. Persistence and decay are not opposing explanations. They are jointly regulated aspects of event formation.

Human events involve multiple forms of persistence operating across different timescales. Membrane and synaptic activity may remain consequential over brief intervals. Intracellular signalling and recurrent network activity may preserve selected states for longer periods. Autonomic and affective changes can alter processing after the initial stimulus has disappeared. Memory can preserve and later reconstruct consequences across years [12, 13, 68, 94, 96, 97, 103].

The Stochastic Pump does not collapse these mechanisms into one undifferentiated memory process. Its role is to sustain the physical conditions through which retained biological history can continue altering present processing. Integration occurs when current input is processed through that retained and changing condition. The result depends not only upon the disturbance, but upon what the organism has already become through the developing event.

As retained consequences accumulate and interact, the system may approach a transition beyond which its available states become substantially reorganized. A biological threshold is not an abstract decision point placed above the mechanism. It is expressed through changing electrical, chemical, metabolic, mechanical, network, and regulatory relations within the living system [64, 66, 68, 90, 91, 103].

The Stochastic Pump supports threshold approach by maintaining the relevant variables, coordinating their interaction, and supplying the work required for the system to remain organized while departing from its earlier condition. It does not drive every disturbance toward commitment. It also supports containment. Subthreshold alterations may decay, inhibition may prevent wider propagation, and resources may not be recruited when the developing state fails to engage the required organization.

Threshold architecture therefore allows the organism to remain responsive without reacting indiscriminately.

In the flytrap, an initial qualifying contact can leave a temporary physiological consequence without producing closure. A subsequent stimulation arriving within the relevant interval can further recruit the electrical and calcium-related state toward the closure-associated transition condition, after which the mechanically primed trap can undergo snap-through. Broader ion-, water-, and metabolic regulation supports the prepared and recovering organism but should not be identified with the immediate motor of the rapid snap. No single component independently constitutes the threshold; the transition depends upon their organized relation across the developing event [66, 77–79, 84, 85].

Human events can cross several distinct thresholds. A disturbance may recruit attentional capture, autonomic mobilization, motor preparation, memory encoding, behavioural response, or report. These transitions need not occur simultaneously, and none should be treated automatically as the complete organism-relative event [64, 68, 73–75, 97, 107]. The Pump supports the physical reorganization associated with each while preserving sufficient systemic stability for continued function.

Commitment means that the developing event has begun to constrain what can occur next. The trap is no longer merely open and receptive. A body may no longer remain in its prior state of readiness. Attention, posture, circulation, muscular preparation, or behaviour may already have shifted. The organism has entered a new trajectory.

Such commitment requires controlled destabilization. Electrical potentials change, ion distributions are disturbed, calcium concentrations shift, mechanical or muscular tension changes, and vascular, respiratory, hormonal, or autonomic conditions may be reorganized. These departures are not incidental failures of regulation. They constitute part of the biological response [24, 77, 78, 82, 90–92].

The Stochastic Pump should therefore not be understood as a mechanism that always returns every variable immediately toward baseline. Perfect resistance to change would prevent meaningful events from developing. Its role is to regulate the temporary use of maintained gradients and resources. It permits selected variables to depart from earlier conditions while protecting the wider organization required for the transition to remain viable.

The flytrap's rapid closure illustrates this relation. Electrical and calcium-related signalling recruit a mechanically primed structure into the closure transition, while rapid modulation of cell-wall mechanics releases stored elastic energy and permits snap-through. Broader ion-, water-, metabolic, and regulatory processes contribute to preparation and the wider capture cycle

without serving as the immediate motor of the snap [66, 77, 79, 81, 84–86]. The Pump is not an independent motor positioned behind the movement; it describes the coordinated biological work through which the relevant conditions are maintained, recruited, and later restored.

Continued prey movement may extend the event into tighter sealing, hormonal signalling, glandular activation, digestion, and nutrient absorption. The trap does not merely repeat the initial response. It enters a differently organized state with altered regulatory and energetic demands [65, 79, 81, 87–89].

Controlled destabilization is more widely distributed in humans. A perceived threat can alter neural activity, attention, memory access, respiration, cardiovascular state, muscular tension, endocrine regulation, and action readiness. These changes may be adaptive when coordinated and limited. They can become harmful when excessively prolonged, repeatedly reactivated, or inadequately contained [11–15, 21, 22, 24, 56].

The Pump therefore contributes both to effective transformation and to the limits within which transformation remains viable. It maintains sufficient coordination for several systems to change together without the organism losing its capacity to regulate the developing event.

Every consequential transition creates a possibility of excess. Electrical excitation can spread too widely, calcium can remain elevated too long, inflammatory processes can exceed their useful range, and autonomic mobilization can persist after the initiating demand has ended. Mechanical commitment may consume resources without benefit. In recursively organized human events, retained history can repeatedly recruit bodily regulation after the external disturbance is absent [12, 13, 21, 24, 82, 90, 91, 111].

The Stochastic Pump includes the processes that constrain these possibilities. Containment does not mean suppression of every response. It means maintaining the event within a range compatible with organized continuation and resolution. Inhibition, buffering, feedback, transporter recruitment, vascular adjustment, metabolic redistribution, hormonal regulation, and behavioural interruption can all contribute [24, 82, 90, 91, 111].

The living system must regulate which disturbances are amplified, preserved, redirected, or allowed to decay. This regulation need not involve conscious judgment. It is enacted through the causal organization of the organism. The present biological condition supplies part of the constraint: a response sustainable in one state may be excessive in another. Differences in physiological condition can therefore alter the cost, duration, or consequences of otherwise comparable disturbances [24, 56, 57].

The Pump is therefore state-dependent. Its recruitment reflects both the developing event and the organism’s present capacity to sustain and contain it.

Resolution begins while the event is still developing. As soon as electrical, chemical, mechanical, metabolic, or regulatory variables depart from maintained conditions, processes of containment and restoration are recruited. Some changes must be reversed rapidly. Others must remain active until the biological task is completed. Still others may be incorporated into memory, learning, altered regulatory condition, or structural adaptation [24, 77–82, 90, 91, 94, 96, 101].

The Stochastic Pump contributes to these different outcomes. Electrical recovery may require repolarization and reconstruction of ion gradients. Calcium may be buffered, removed, or returned to intracellular stores. Metabolic substrates must be replenished, signalling molecules cleared or recycled, and heat and reaction products redistributed or removed. Mechanical and fluid conditions must regain sufficient stability, while autonomic and endocrine activity must settle or reorganize. Where continued viability permits, these processes restore or reorganize sufficient coordinated availability for later events to remain possible [24, 33–35, 78, 82, 90, 91, 109, 111].

Resolution is therefore not erasure or exact reversal. It concerns the organized containment, incorporation, reversal, or reorganization of the disturbance and its consequences; where continued viability permits, this supports renewed biological availability.

In the flytrap, the fastest electrical component may resolve while calcium-related and metabolic consequences remain. Mechanical closure may persist as sealing and digestion continue. Reopening may occur only after the capture trajectory has been completed or abandoned. The event resolves across nested timescales, and no single return-to-baseline measurement defines its endpoint [65, 77–81, 86].

Different outcomes also produce different recovery trajectories. A false closure requires restoration of the open and excitable condition without the nutritional return associated with successful capture. When prey is retained, the trap remains committed while digestive and absorptive processes unfold. The Pump supports both trajectories, but the organization, duration, and cost of recruitment differ [65, 79, 81, 86–89].

Human events display still greater variation. A brief sound may be incorporated and rapidly lose relevance. An injury may recruit prolonged regulation, inflammation, protective action, and learning. A social threat may end externally while autonomic or narrative activity continues. A perceptual event may resolve as an immediate sensory transition while a retained consequence later becomes material for another event [12, 13, 27, 96, 101].

The original event should not be extended indefinitely merely because some consequence remains. Retained consequences may continue to influence the event while it is still developing, but persistence alone does not erase its temporal boundary. Once an antecedent event has sufficiently resolved, subsequent reactivation of retained biological history constitutes a new organism-relative transition arising from the condition left by the earlier event.

For repeatable living transitions, the practical endpoint of resolution is sufficient renewed or reorganized functional availability rather than exact return to the preceding microstate. Such a return is neither physically possible nor biologically required. Molecules have moved, energy has been used, structures may have changed, memories may have formed, and regulatory conditions may have shifted. Resources may have been depleted, redistributed, or acquired.

Renewed availability means that the organism has restored or reorganized enough of its physical conditions to remain capable of further consequential transitions. A flytrap may reopen and regain the capacity for capture. A neuron may recover excitability. A sensory system may become responsive to new input. Autonomic activity may settle within a viable range. A human organism may recover attentional flexibility, behavioural availability, and the capacity to integrate subsequent events [24, 40, 55, 86, 90, 91].

The organism is not unchanged, but it remains organized. The resolution of one event becomes part of the maintained condition from which later events begin. Biological history can therefore accumulate without requiring the organism's entire existence to be treated as one temporally unbounded event.

Although the Stochastic Pump operates continually at the systems level, its event-specific recruitment is selective. Not every component participates equally in every transition. Flytrap closure recruits electrical, calcium-related, hydraulic, mechanical, metabolic, and hormonal processes in a pattern appropriate to capture. A human visual event recruits sensory, neural, vascular, attentional, and bodily support differently from a painful event. A memory-driven episode may recruit recurrent neural, autonomic, endocrine, and muscular processes without a new external disturbance [12, 13, 21, 27, 29, 33–35, 65, 79, 81, 90, 91, 106, 114, 115].

The Pump consequently has no universal activation pattern. Its identity lies in the function performed across different implementations: maintaining the relevant conditions, supporting their controlled use, coordinating the resulting alteration, and restoring sufficient organization afterward.

This event-specificity also distinguishes the Pump from baseline metabolism. Baseline activity preserves general biological availability. Event-specific recruitment reorganizes part of that maintained capacity around a particular consequential transition. The two overlap, but they are not interchangeable. An empirical account must therefore compare an event with an appropriate baseline and determine which components changed, when and where they changed, and how those changes related to registration, persistence, integration, commitment, and resolution [33–35, 42, 112].

Following the Pump across the transition also permits mechanistic dissociation. Registration may remain local while wider propagation fails. A trace may form but decay before temporal integration occurs. Integration may remain intact while mechanical or behavioural expression is blocked. Commitment may begin while insufficient metabolic support prevents sustained transformation. The principal response may occur while restoration remains delayed.

These are different failures affecting different phases of the event. In the flytrap, mechanical sensitivity may remain while electrical propagation or closure is impaired. Threshold behaviour may change when particular transport or signalling processes are disrupted. Recovery of electrical excitability may precede restoration of complete trap function. In humans, early sensory activity may remain while wider integration is disrupted, motor expression may fail while other processing remains intact, and behavioural recovery may lag behind restoration of some neural dynamics [30, 31, 38–40, 53–55, 60, 64, 73–75, 77, 80, 81, 113].

The framework therefore predicts that the biological profile of failure will depend upon which maintenance, recruitment, coordination, containment, or restoration processes have been disrupted. Whether the externally visible response occurred is not sufficient to identify which part of the event failed. Nor should impairment of one component be treated automatically as abolition of the complete organism-relative transition.

The relation between the Stochastic Pump and the bounded event can now be stated precisely. The Pump maintains the physical conditions from which selective registration becomes possible. It supports the perturbations through which a disturbance alters the organism, preserves and constrains the consequences required for temporal integration, coordinates threshold approach and commitment, sustains organized transformation, contains destabilizing excess, and contributes to resolution and renewed availability.

These functions make the event physically possible, but they do not independently constitute the complete event. The bounded organism-relative transition includes the particular disturbance, its selective registration, its retained consequence, its integration with the organism's present condition and biological history, its organism-relative valuation, its coordinated transformation, and its resolution.

The Stochastic Pump implements and sustains the mapped event; it is not by itself the mapped event.

This distinction becomes especially important in human recursive processing. A compact event may move toward resolution after the external disturbance ends. In a recursively organized event, retained biological history can reintroduce aspects of the disturbance into present processing. The Pump may then be recruited again without a new external trigger, prolonging, amplifying, redirecting, or reopening the transition through memory, comparison, ownership, judgment, and future projection [12, 13, 21, 69, 96–102, 114, 115]. The mechanisms through which this recurrent recruitment becomes organized will be examined in the following subsection.

6.5 Recursive Recruitment

The distributed biological work described by the Stochastic Pump supports both primary organism-relative events and later memory-dependent cognitive processes through which retained material can be reactivated, compared, interpreted, and projected within present processing. These functions must remain distinct.

The support architecture does not begin when recursive cognition appears. Its more basic operation is already required for primary registration, persistence, integration, organism-relative valuation, transformation, and resolution. Human recursive processing can repeatedly recruit this existing maintenance-and-restoration architecture into new or prolonged patterns of biological activity. Recursion therefore changes the source, duration, and organization of recruitment; it does not introduce a separate physical principle.

A primary event may begin with an external or internal disturbance. Light alters retinal receptors, sound activates auditory pathways, tissue damage can recruit nociceptive processing, and changes in blood chemistry can enter interoceptive regulation. The disturbance is registered within the organism's present condition, integrated with retained biological history, differentially valued, and moved toward transformation or resolution. Its initiating source may end before all of its consequences have resolved. Neural, autonomic, hormonal, muscular, or mnemonic changes may persist while some variables recover and others are retained [12, 13, 15, 23, 27, 29, 94, 96].

Human memory-dependent cognition creates an additional possibility. Retained or reconstructed representational content can become active within present processing and itself function as a condition for further organism-relative biological activity. A remembered event, imagined possibility, comparison, image, plan, judgment, or linguistic representation is not the external condition it represents. Its activation, however, is a present biological occurrence [9, 10, 68, 69, 96–99, 114, 115].

Representational content can therefore become a present internal stimulus. The organism is not responding to a past or future event as though that event were physically present. It is responding to present biological activity produced by remembering, imagining, comparing, interpreting, or planning. That present internal stimulus can recruit a new organism-relative biological state-transition according to the organism's current condition, retained history, available responses, and ongoing regulation [12, 13, 16, 114, 115].

This is recursive recruitment.

Recurrence must nevertheless be distinguished from recursive cognitive recruitment. Recurrence is a general biological relation in which the consequences of earlier activity alter what occurs next. Feedback may amplify, stabilize, redirect, suppress, or terminate a developing response. The first stimulation of a flytrap changes the condition encountered by a later stimulation, and continued prey movement can recruit additional signalling and downstream capture processes. These are recurrent biological relations [65, 66, 103]. They do not by themselves establish memory-dependent conscious thought, autobiographical organization, or recursive cognition.

Not every feedback loop is thought, not every recurrent neural process is conscious cognition, and not every persistent biological state is memory-dependent representation [64, 103]. Recursive cognitive recruitment requires retained or reconstructed content to become active within present conscious processing and to participate in the conditions from which further processing develops.

A primary organism-relative event does not require prior narrative ownership. The organism registers a disturbance according to its sensory organization, regulatory condition, retained history, vulnerability, and available responses. Primary biological valuation concerns the organism-state-dependent differential organization of that disturbance; the event does not remain neutral while awaiting interpretation by a narrator.

A nociceptive disturbance, for example, can recruit withdrawal, autonomic adjustment, attention, and protective action before an explicit thought such as “I am in pain” is formed. A visual event can be registered, differentiated, and integrated before an object is verbally named or autobiographically claimed. Later memory-dependent cognition can recognize, compare, interpret, describe, or report aspects of what has occurred, but it does not create the antecedent primary transition that made such later processing possible [27, 29, 60, 64, 71, 75, 102].

Once retained material can be reactivated, a new external disturbance is no longer required for further organism-relative recruitment. A remembered threat can function as a present internal stimulus. An imagined loss, rehearsed conversation, anticipated demand, or practical plan can likewise become present input to a new biological transition. The represented circumstance is absent, but the present representation is physically instantiated and can recruit biological processing now [12, 13, 16, 114, 115].

This distinction is important. Thought does not stand outside phenomenology and modify it as a separate downstream object. Nor does a memory reach backward and continue the earlier event. Rather, memory-dependent representation occurs in the present and can supply stimulus conditions for another organism-relative biological state-transition. The subsequent transition is a new present event, or part of an event still developing, depending upon the temporal relation between the two.

Recursive recruitment may therefore begin while an antecedent event is still developing, in which case the internally generated stimulus can modify the conditions of that continuing transition. When retained material is reactivated after the antecedent event has sufficiently resolved, the reconstruction constitutes a new present bounded event arising from the biological condition left by the earlier one. In either case, the externally absent event is not literally continuing; present biological activity is being organized through retained or reconstructed content [114, 115].

This organization also clarifies psychological time. Physical processes always unfold temporally, but psychological time is more specific: it is the temporal organization intrinsic to memory-dependent conscious thought itself. It does not require explicit recollection of the chronological past, projection into the future, or self-reference. Recognition, comparison, interpretation, imagery, evaluation, planning, recollection, and anticipation can all recruit retained biological history within present conscious processing.

The represented past is not literally present again, and an imagined future has not yet occurred. The representation itself, however, is occurring now. When such content functions as present input and recruits a new organism-relative biological state-transition, psychological time is materially instantiated through present biological activity rather than through contact with a past or future event [12, 13, 16, 114, 115].

> *Put more simply, psychological time does not mean only thinking about yesterday or imagining tomorrow. It means that what has been learned, remembered, or otherwise retained can become active in thought now and help determine what biological event occurs next. A remembered argument is not happening again, and an anticipated meeting has not yet happened, but thinking about either can function as a real present stimulus. The organism can then undergo a new state-transition in response to that present internal input.*

This is why psychological time matters to recursive recruitment. Retained content can become a present internal stimulus; the biological transition recruited by that stimulus changes the organism's current condition; and that altered condition can in turn affect what is available to later memory-dependent cognition. The sequence therefore proceeds through successive present biological transitions rather than through thought acting upon phenomenology from outside the biological process.

A brief external event can consequently become the source of several later present events. The organism may reconstruct it, compare it with earlier experience, imagine alternative outcomes, anticipate recurrence, or use it in practical planning. Each return is present biological activity generated from retained material [9, 10, 96–99, 114, 115]. The original disturbance is not literally prolonged simply because its representation is reactivated.

Self-referential ownership and autobiographical narration can become particularly persistent forms of recursive recruitment. The virtual reference point involved in such processing has already been derived from retained history, repeated self-indexing, social and linguistic organization, and psychological-time recursion earlier in the manuscript. The present subsection does not repeat that derivation. Its narrower concern is how an already available self-referential or non-self-referential representation can function as present internal input and recruit further biological state-transitions.

This distinction also prevents recursive cognition from being reduced to self-reference. Practical comparison, recognition, planning, problem-solving, imagery, language, prediction, and reconsideration can all recruit retained material without being organized around autobiographical ownership. Self-referential recursion is therefore an important special case of a broader memory-dependent recruitment architecture rather than its defining condition [68, 97–99, 102, 115].

Recursive recruitment can amplify or prolong biological activity without any change in the original external disturbance. Repeated attention, memory retrieval, prediction, comparison, imagery, self-reference, or bodily feedback can supply new present stimuli that repeatedly recruit organism-relative transitions. A brief social interaction can be reconstructed many times. A bodily sensation can repeatedly become input to further interpretation. A practical problem can sustain successive cycles of comparison and planning until a workable resolution is reached [12, 13, 21, 69, 114, 115].

Amplification need not appear as a universal increase in one physiological quantity. Attention may narrow, autonomic regulation may remain altered, recovery may be delayed, action may be inhibited, or biological demand may be redistributed across systems. The relevant prediction is a changed temporal and systemic trajectory associated with repeated internally generated recruitment, not a single quantity that must always rise [12, 13, 21].

The Stochastic Pump supports this continuation by maintaining neural excitability, metabolic and vascular support, bodily regulation, gradient restoration, and containment while these systems are repeatedly recruited. The cost of recursion is not a separate form of energy added to ordinary biology. It is the repeated engagement of established maintenance, signalling, regulatory, and restorative processes [24, 33–35, 42, 90, 91, 111].

Recursive recruitment is not intrinsically maladaptive. Memory-dependent cognition supports planning, communication, problem-solving, reconsideration, prediction, learning, and deliberate action. It can prolong biological recruitment, but it can also reduce or terminate it by supplying information that changes the conditions of the next transition, redirects attention, identifies a disturbance as harmless, supports action, or resolves an uncertainty [68, 96–102, 116].

A remembered context, for example, may provide information indicating that an ambiguous stimulus is not dangerous. A plan may organize action that resolves an unmet requirement. Reappraisal or social information may become new present input from which a less defensive biological transition develops. In each case, cognition does not suppress phenomenology from outside. It provides present conditions from which a different subsequent organism-relative transition can occur [57, 70, 100, 101, 116].

Recursive recruitment can become maladaptive when internally generated content repeatedly renews organism-relative demand without producing effective action, revision, or resolution. Each reconstruction can become a new present stimulus, recruit another biological transition, and alter the condition from which subsequent cognition begins. Repeated cycles can therefore become self-maintaining even after the initiating external disturbance is absent [12, 13, 21].

Under such conditions, the Stochastic Pump may be performing its ordinary biological support role under prolonged or repeatedly renewed demand. Continued recruitment does not by itself imply that the Pump is malfunctioning. The persistence may instead arise from the organization repeatedly generating present internal stimuli that recruit further transitions.

Repeated recruitment can eventually alter the support conditions from which later events begin. Sustained autonomic, attentional, metabolic, endocrine, muscular, or behavioural organization may change recovery, sleep, resource distribution, and later responsiveness. Recursive cognition can therefore produce cumulative biological consequences even when each individual cycle remains within viable limits [12, 13, 21, 24, 117].

The duration and complexity of recursion must not be converted into a simple equation between Pump activity and phenomenal magnitude. A prolonged thought is not necessarily more intense than a brief pain. A metabolically costly regulatory condition is not necessarily phenomenally rich. A highly recursive sequence may contain repetitive rather than differentiated content, while a vivid sensory event may occur with little autobiographical or narrative elaboration.

Recursion therefore changes temporal depth, representational organization, counterfactual flexibility, and the capacity for repeated reconstruction. It can prolong, attenuate, redirect, or reorganize subsequent events, but these consequences must be evaluated through the complete organization of each bounded transition rather than inferred from energy use or duration alone.

The same caution applies across species. Recurrent flytrap signalling does not become human recursive cognition merely because earlier biological activity changes what occurs later. The continuity lies in retained biological consequences and recurrent causal organization. The discontinuity lies in the representational, mnemonic, symbolic, counterfactual, and cognitive capacities available for renewed recruitment [65, 66, 96–103].

Recursive recruitment should therefore produce a temporal and systemic profile distinct from that of a primary transition that moves toward resolution without repeated memory-dependent re-entry. The initiating external disturbance may decline or disappear while internally generated content continues to recruit neural, autonomic, vascular, muscular, metabolic, or endocrine organization. Interruption or resolution of the relevant memory-dependent sequence should alter that trajectory even when the original sensory systems remain intact [12, 13, 21, 114, 115, 117].

These expectations do not specify one universal biomarker. They specify an event-relative pattern: retained or reconstructed content becomes present internal input, successive biological transitions are recruited after the initiating disturbance has ended or changed, and the resulting systemic burden persists, redistributes, renews, or resolves according to the organization of the sequence.

The Stochastic Pump provides the physical support through which these successive present events remain possible. It does not generate the representational content or independently determine its organism-relative significance. Its repeated recruitment should instead leave measurable biological consequences corresponding to the organization, duration, recurrence, and resolution of the developing sequence [12, 13, 16, 21, 33–35, 42].

Those measurable consequences provide the transition to the Friction Signatures examined in the following subsection.

6.6 Friction Signatures and Empirical Access

The Stochastic Pump denotes the proposed systems-level organization of distributed biological work supporting bounded organism-relative events. Because that organization is distributed across molecular, cellular, tissue, and organismic processes, it cannot be identified through a single molecular measurement, metabolic variable, or anatomical location. Its event-specific recruitment must instead be investigated through convergent biological measurements associated with maintenance, coordinated transformation, containment, and restoration.

The term Friction Signature refers to the measurable biological profile associated with that recruitment.

Friction does not denote a separate substance opposing the event, nor does it imply that biological work is inefficient in the ordinary engineering sense. It refers to the measurable energetic, regulatory, dynamical, and restorative consequences associated with maintaining and reorganizing living biological conditions during a consequential transition. Some dimensions concern energetic expenditure directly; others concern organization, timing, coupling, persistence, or recovery.

A Friction Signature is therefore not one measurement. It is a coordinated and temporally organized pattern. A bounded event may alter electrical activity, calcium dynamics, metabolic demand, local heat production, blood flow, respiration, autonomic condition, mechanical configuration, network organization, and recovery time [16, 21, 33–35, 38–44, 79, 82, 90, 91, 111, 112]. Each measurement provides access to a different aspect of the underlying biological work or organization. No individual measure independently identifies the Stochastic Pump.

Its evidential value lies in convergence. When several measurements change in a coordinated relation to the initiation, persistence, disruption, and resolution of the same event, they provide empirical access to the distributed work through which that event is sustained.

This preserves the levels of description established earlier. Molecular, cellular, tissue, and organismic mechanisms perform the physical work. Their coordinated maintenance-and-restoration relation is the systems-level organization described by the Stochastic Pump. The particular organism-relative transition is the bounded event. Friction Signatures are the externally measurable traces associated with implementing and resolving that event. The Glow is proposed as the organism-relative inside view of the complete event.

Friction Signatures are therefore neither the Glow nor an external cause that manufactures it. They provide third-person access to the biological organization implicated in the proposed identity relation.

A Multidimensional Biological Trajectory

The phrase Friction Signature should not be interpreted as a universal biomarker that rises whenever phenomenology is present. Different events recruit different tissues, mechanisms, and regulatory systems. A painful event will not have the same measurable profile as a visual event. A brief sensory transition will differ from sustained rumination. A flytrap closure will not reproduce the neural, vascular, autonomic, and self-referential organization of a human event.

The relevant continuity lies not in identical measurements, but in the relation being measured: maintained biological organization is selectively recruited, disturbed, coordinated, and restored.

A Friction Signature should therefore be treated as a multidimensional trajectory rather than a single scalar quantity. Its relevant features may include the location, magnitude, onset, duration, and rate of change of the measured response; its relation to the initiating disturbance; its persistence after that disturbance has ended; the systems recruited; the order in which variables change; the degree of recovery; and the interval required for renewed availability.

This temporal structure is essential. Measurements obtained at one moment may fail to represent the organization of the event. Two conditions may produce similar peak metabolic demand while differing substantially in onset, distribution, duration, recurrence, and recovery. One event may resolve rapidly, while another is repeatedly renewed. One may remain localized, while another recruits wider autonomic, affective, or self-referential systems.

The empirical profile must therefore preserve the trajectory of the bounded event rather than reduce it to a maximum value or an isolated correlation.

Foundational Friction Signature Measurement Families

The present subsection emphasizes four foundational measurement families because they provide comparatively direct access to energetic work, organism-level regulation, and restoration associated with Stochastic Pump recruitment: local heat production; metabolic recruitment within event-relevant systems; autonomic regulation and allostatic burden; and entropy production or integrated metabolic cost. These categories are neither exhaustive nor intended as orthogonal state-space dimensions.

Additional empirical measures may include oxygen metabolism, lactate dynamics, cerebral blood flow, electrophysiological activity, functional connectivity, calcium dynamics, ATP turnover, cortisol, respiratory change, local-field-potential power, EEG complexity, photosynthetic performance, and mechanical or fluid-regulatory recovery [16, 21, 33–35, 38–44, 79, 82, 90, 91, 111, 112, 118, 120, 121]. Later quantitative formalization can organize such measures across additional theoretical dimensions, including recursive recruitment, network organization, complexity dynamics, and temporal persistence. The present four-family discussion therefore introduces major classes of empirical access rather than fixing the final dimensionality of the Friction Signature.

The framework does not require every investigation to measure every variable. It requires measures appropriate to the organism, event, biological system, and phase under examination.

Local Heat Production

Biological work produces heat. ATP hydrolysis, ion pumping, active transport, chemical transformation, muscular activity, and related processes all contribute to heat generation. Electrical signalling is especially relevant because ion movement partially dissipates previously maintained electrochemical gradients. Restoring those gradients requires energy-dependent work, part of which is released as heat [33–35, 44, 90, 92].

Local heat production is therefore a plausible physical consequence of differential Stochastic Pump recruitment. It must, however, be interpreted cautiously. Heat is produced by many biological processes, and a temperature change does not independently establish registration, integration, organism-relative valuation, or phenomenology.

Its evidential significance depends upon location, timing, and relation to the bounded event. Heat arising from unrelated movement, inflammation, generalized metabolism, or vascular change cannot automatically be assigned to the target process. Relevant interpretation would require evidence that the thermal alteration tracks the initiation, persistence, restoration, or repeated recruitment of the event under study.

The prediction is not that phenomenology possesses a unique temperature. It is that the additional biological work required to sustain and restore a bounded event should contribute to a measurable energetic profile where spatial and temporal resolution are sufficient.

Metabolic Recruitment

Metabolic measurements provide a second form of empirical access. In human neural systems, glucose utilization, oxygen metabolism, blood flow, and related variables can reveal aspects of the support recruited by active networks [33–35, 42, 112, 118]. Electrical and synaptic activity disturb ion gradients, release and recycle transmitters, alter intracellular signalling, and require continuing cellular and vascular regulation [33–35, 90, 91, 111]. The resulting metabolic profile may therefore help identify which systems remain engaged as an event begins, persists, changes, and resolves.

The relevant networks will depend upon the event. Thalamocortical, sensory, affective, interoceptive, self-referential, and control systems may contribute in different combinations [23, 27, 29, 64, 68, 69]. No one network should be identified as the anatomical location of the Stochastic Pump.

Activity within the default-mode network should likewise not be equated with the narrator, rumination, or phenomenology. That network participates in autobiographical memory, self-reference, internally directed cognition, simulation, social cognition, and other functions [69, 119]. Its activity is neither unique to one recursive state nor sufficient to identify the complete organism-relative event [69, 119].

The empirical target is a state-specific pattern of recruitment, coupling, temporal persistence, and interaction among the relevant systems. A recursively sustained event may recruit self-referential processes together with affective, attentional, autonomic, and regulatory systems. A primary perceptual event may exhibit a substantially different organization. The comparison must therefore concern the coordinated profile rather than the amplitude of one region or network.

Direct and indirect measurements must also be distinguished. Positron-emission tomography can provide information about glucose utilization [42]. Appropriately calibrated MRI and physiological methods can estimate changes in cerebral oxygen metabolism under specified assumptions [118]. Blood-oxygen-level-dependent imaging measures a haemodynamic signal arising through neurovascular coupling [112, 118].

BOLD imaging is scientifically valuable, but it does not directly measure ATP turnover, heat production, or the total metabolic cost of an event [33–35, 42, 112, 118]. It should therefore be described as evidence of neural and haemodynamic recruitment rather than converted directly into thermodynamic expenditure without additional measurement and modelling.

Autonomic Regulation and Allostatic Burden

Organism-relative events are not confined to local neural or cellular activity. They may alter respiration, heart rate, vascular tone, skin conductance, muscular tension, endocrine regulation, digestion, immune activity, and the balance among sympathetic and parasympathetic processes [11–15, 21, 22, 24]. These changes are particularly relevant when an event involves threat, affective valuation, sustained uncertainty, preparation for action, or recursive self-reference.

Event-level measurements can provide access to this organism-level regulatory recruitment. Candidate measures include heart rate, heart-rate variability, blood pressure, respiratory pattern, skin conductance, endocrine measures such as cortisol, muscular tension, cardiovascular recovery, and persistence of physiological alteration after the initiating disturbance has ended [11–15, 21, 22, 24, 120]. These measures characterize acute or sustained regulatory activity; none should individually be equated with allostatic load [120].

Allostasis concerns adaptive regulation through changing physiological conditions. Allostatic load or burden concerns the cumulative biological cost associated with repeated, prolonged, or inadequately terminated recruitment of regulatory systems [24, 120]. A single bounded event may therefore exhibit substantial autonomic or allostatic regulation without by itself establishing cumulative allostatic load. Repeated recruitment, prolonged recovery, and altered baselines provide the more appropriate bridge from event-level regulation toward cumulative burden.

No universal direction should be assumed. Sustained recruitment does not require heart rate always to increase, heart-rate variability always to decrease, or cortisol always to rise. Different conditions may produce mobilization, inhibition, freezing, withdrawal, respiratory slowing, or mixed regulatory profiles. Age, health, medication, baseline physiology, breathing pattern, emotional intensity, task structure, and measurement interval may all influence the observed result [11–15, 21, 22, 24, 120].

The Friction Signature must therefore be defined as a prespecified pattern of altered regulation, sustained burden, repeated recruitment, or delayed recovery rather than as a universal increase in every autonomic marker.

This domain becomes especially informative in recursive events. After an external disturbance has ended, retained or reconstructed content can function as present internal stimulus and recruit subsequent organism-relative biological transitions. Autonomic, endocrine, respiratory, muscular, or cardiovascular regulation may therefore remain altered or be recruited again even though the initiating external condition is absent [12, 13, 21, 114, 115, 117]. The relevant signature is not arousal alone, but the persistence, redistribution, repeated recruitment, or delayed recovery of organism-level regulation across successive present transitions.

Entropy Production and Total Metabolic Cost

The broadest Friction Signature family concerns the energetic and irreversible physical consequences of sustaining and resolving the event. Living systems preserve organized differences through continuing free-energy throughput [32, 121]. Gradients are established and restored, chemical reactions proceed, heat and metabolic products are released, resources are redistributed, and some changes are incorporated into lasting structure or biological history.

Entropy production and metabolic cost are related but should not be treated as interchangeable measurements [32, 121]. Metabolic cost concerns the energetic and material resources recruited by biological processes and may be approached through quantities such as substrate use, oxygen consumption, respiration, ATP-dependent work, or heat production. Thermodynamic entropy production concerns irreversible dissipation and, in a complex open living system, generally requires additional modelling and explicit boundary assumptions [121].

The framework therefore does not infer total entropy production directly from glucose use, BOLD activity, oxygen consumption, behavioural complexity, or any other isolated measurement. Such observations can constrain parts of the energetic trajectory,

while any estimate of entropy production must specify the physical variables, system boundary, timescale, and modelling assumptions from which it is derived [121].

In principle, an integrated account of event-related energetic cost would include relevant work performed before, during, and after the most visible phase of the transition. This may include event-specific readiness, recruitment during the transition, restoration of disturbed gradients, regulatory support, clearance, and recovery of functional availability.

In practice, total entropy production and complete metabolic cost are difficult to measure. Most experiments capture only selected parts of the process [33–35, 42, 44, 112, 118, 121]. One study may measure electrical activity, another blood flow, and another respiration, temperature, glucose utilization, or autonomic recovery. The framework should not claim that existing methods already provide a complete thermodynamic account of complex human events.

Integrated cost therefore remains a systems-level target to be constrained through convergent measurements and explicit modelling. The difficulty of obtaining such an estimate creates a clear evidential obligation. Any proposed estimate must remain anchored to identifiable biological operations and stated assumptions. It cannot be inferred solely from behavioural complexity, reported intensity, or theoretical expectation.

The Flytrap as a Compact Measurable Profile

The Venus flytrap provides a compact test case for the convergence principle because one bounded capture sequence can be experimentally initiated and followed across several independently measurable phases. Mechanical input and inter-stimulation timing can be controlled; electrical and calcium-related dynamics recorded; threshold-dependent transformation observed; metabolic consequences measured; and later capture phases, recovery, and renewed availability followed across time [65, 66, 76–89, 113].

These measurements are useful because they sample different operations and timescales within the same developing event. Electrical and calcium-related measures provide access to early registration, propagation, and temporal persistence; closure marks threshold-dependent mechanical transformation; metabolic measurements provide access to altered energetic recruitment; and recovery of excitability and reopening provide access to restoration and renewed availability [65, 66, 76–89, 113]. Their evidential value lies in whether these independent measures align with the trajectory of the same bounded transition.

This is the form of convergence required by the Stochastic Pump framework.

The empirical claim is not that one flytrap action potential constitutes a Friction Signature of phenomenology, nor that increased respiration proves the presence of a plant inside view. The narrower claim is that a non-neural bounded event can produce a coordinated and measurable biological trajectory spanning registration, persistence, commitment, energetic consequence, transformation, and recovery [65, 66, 76–89, 113].

That trajectory provides an experimentally accessible case through which the proposed systems organization can be investigated.

Human Friction Signatures

Human events require a broader measurement strategy. A primary sensory event may be examined through electrophysiology, network dynamics, metabolic or haemodynamic recruitment, autonomic change, behaviour, and recovery [21–24, 33–35, 38–44, 64, 112, 118]. A recursively sustained event may additionally require measures of memory-dependent re-entry, temporal persistence, self-referential processing where relevant, altered regulation after stimulus offset, and interaction among mnemonic, affective, attentional, and bodily systems [12, 13, 21, 69, 114, 115, 117, 119].

Rumination provides a useful example. The prediction is not that rumination produces more consciousness. It is that sustained recursive self-referential evaluation should produce a biological trajectory distinguishable from calm wakefulness and from appropriately matched non-ruminative cognition [12, 13, 21, 119].

The predicted pattern may include continued recruitment of self-referential and affective systems, persistence after the initiating disturbance has ended, altered autonomic or wider organism-level regulatory recruitment, sustained haemodynamic support, delayed recovery, and an increased tendency to re-enter the same organization [12, 13, 21, 117, 119].

The evidence is not equally developed across these domains. Recursive and temporal organization can be assessed relatively directly through controlled state induction, thought sampling, behavioural report, and persistence after stimulus offset. Network recruitment can be examined through electrophysiology and neuroimaging, although no single network is specific to rumination [119]. Autonomic and endocrine findings provide meaningful but variable support [12, 13, 21, 120].

Direct energetic evidence remains more limited because many studies measure BOLD activity or functional connectivity rather than glucose utilization, oxygen metabolism, ATP turnover, heat production, or total dissipative cost [42, 112, 118, 119]. The framework must preserve these evidential boundaries. Biological plausibility and indirect alignment do not constitute a completed empirical demonstration.

Principles of Measurement

A valid Friction Signature study must preserve the organization of the bounded event.

An appropriate baseline is essential. The relevant comparison is not simply activity against inactivity because living systems remain metabolically and physiologically active at baseline [24, 33–35, 42]. The study must distinguish continuing maintenance from event-specific recruitment.

Temporal measurement is equally important. Onset, persistence, recurrence, and recovery may be more informative than peak magnitude. A short-lived increase and a repeatedly renewed state may reach similar maximum values while representing substantially different biological trajectories.

Measurements should also be localized where possible. A whole-organism or whole-brain change can conceal the tissues and functions specifically recruited by the target event.

Perturbation provides stronger causal discrimination among components and phases and should be incorporated where experimentally and ethically feasible. Registration may remain while propagation fails. Neural activity may persist while report is blocked. Autonomic recruitment may outlast the initiating stimulus. Restoration may remain delayed despite apparently normal behaviour [30, 31, 38–40, 53–55, 60, 64, 73–75, 80, 113]. Such dissociations can help identify which measurements track readiness, registration, integration, transformation, expression, or recovery.

Convergence is stronger than isolated correlation. A metabolic, vascular, or autonomic change may have several causes. Evidential confidence increases when electrical, metabolic, regulatory, behavioural, and recovery measures change together in the predicted temporal relation.

The profile must also be state-specific. Default-mode activity, increased blood flow, altered respiration, or a change in heart rate may contribute to the profile without independently identifying the event [21, 112, 119, 120]. A useful signature must distinguish the target organization from plausible alternatives.

Finally, the event must be defined independently of the measurements offered as evidence for it. A rumination state, for example, should not be defined entirely by the same biological variables later cited as confirmation. Independent state induction, report, behavioural criteria, or convergent classification are necessary to avoid circularity.

Perturbation and Falsifiability

Friction Signatures make the Stochastic Pump empirically vulnerable. If the Pump is recruited across the bounded transition in the manner proposed, disruption of its components should alter the measurable trajectory in phase-specific ways.

Impaired gradient restoration should affect excitability or recovery. Reduced metabolic support should constrain sustained signalling, commitment, or restoration. Disrupted propagation should separate local registration from wider integration. Interruption of recursive access should shorten or reorganize a self-referential event without necessarily abolishing primary sensory processing [53–55, 63, 64, 73–75, 77, 78, 90, 91, 113]. Where a disrupted component is causally limiting and the remainder of the required architecture remains sufficiently intact, restoration of that component should support recovery of the corresponding phase.

The framework would be weakened if proposed Friction Signatures proved indistinguishable from general metabolic activity. It would be weakened if the profiles could not discriminate among events that reliably differ in organism-relative organization. It would also be weakened if changes attributed to recursive recruitment were explained consistently by unrelated effort, movement, vascular effects, experimental demand, or measurement artefact.

More seriously, the framework would be challenged if reliably distinct bounded events repeatedly occurred without distinguishable biological trajectories despite adequate spatial, temporal, metabolic, regulatory, and organizational measurement.

A negative result bears directly on the specific prediction and measurement relation it tests. A single null finding need not determine the status of the complete architecture when the method samples only one component or timescale, but repeated failures across adequately powered, independently operationalized, and convergent methods would count against the proposed reproducibility of the Friction Signature organization.

The empirical burden is therefore not to discover a universal consciousness meter. It is to determine whether bounded organism-relative events exhibit reproducible, multidimensional biological trajectories corresponding to their initiation, persistence, organization, disruption, and resolution.

The Stochastic Pump identifies the proposed systems-level organization expected to be expressed through that biological trajectory. Friction Signatures provide empirical access to its changing recruitment. Their role is evidential rather than metaphysical: they do not add phenomenology to biology, but make the biological organization implicated in the proposed identity relation progressively measurable.

6.7 Necessary but Not Sufficient

The distributed biological work described by the Stochastic Pump is necessary to the Grind, but Pump-level support considered apart from the complete event is not sufficient for the Glow. This distinction defines the proper scope of the construct.

A bounded organism-relative event cannot remain physically organized without maintained gradients, metabolic support, regulated signalling, coordinated perturbation, and processes capable of containing, incorporating, restoring, or reorganizing the resulting changes. These conditions make selective registration, consequential persistence, integration, organism-relative valuation, transformation, and resolution physically possible. The biological work described by the Stochastic Pump is therefore not incidental to the event. It preserves the conditions from which the transition begins, supports the controlled departures through which it develops, and contributes to its containment, resolution, and—where continued viability permits—renewed or reorganized biological availability [24, 32–35, 82, 90–92, 109, 111].

Complete removal of these functions would abolish physical conditions upon which the candidate event depends. A receptor that cannot preserve the conditions required for transduction ceases to register effectively. An excitable system whose electrochemical gradients cannot be restored progressively loses its capacity to signal. A developing event whose consequences do not persist across the relevant interval cannot support temporal integration across that interval. A transformation unsupported by metabolic and regulatory processes cannot remain coordinated. For repeatable living transitions, a system incapable of sufficient restoration or reorganization progressively loses the capacity for subsequent events [33–35, 65, 66, 78, 82, 90, 91].

The necessity claim is functional rather than molecular. It does not require one transporter, pathway, tissue, or regulatory mechanism to appear in every organism or event. Different biological systems can implement the required maintenance, recruitment, coordination, containment, and resolution through different mechanisms. What must be preserved is the relevant physical function, not one universal component.

Necessity, however, does not establish sufficiency. The biological processes participating in the proposed Stochastic Pump organization support many activities that the framework does not identify as complete mapped events. Ion transport, metabolism, calcium regulation, vascular support, secretion, repair, movement, growth, digestion, and other forms of biological work occur across living systems whether or not the complete relations required for a bounded organism-relative event are present [24, 32–35, 42, 82, 90–92].

The presence of such mechanisms establishes that biological work is occurring. It does not establish selective registration, consequential persistence, integration with present organismic condition and retained history, organism-relative valuation, coordinated transformation, or biological resolution as one complete event. Pump-level activity is therefore broader than the mapped domain. This follows from placing the Stochastic Pump at the level of physical support and systems organization rather than treating it as a universal consciousness mechanism.

The relevant question is not merely whether energy is being used. It is what biological organization that expenditure supports, what disturbance is registered, which consequences persist, how those consequences are integrated with the organism's present condition and retained history, what organism-relative transition follows, and how that transition is contained, incorporated, or resolved. Energetic activity is indispensable to living organization, but energetic activity alone does not satisfy the identity proposition.

Biological Work Does Not Specify Phenomenology

Biological necessity must not be mistaken for phenomenal sufficiency. Metabolism, ion transport, signalling, gradient restoration, mechanical work, and other energy-dependent processes occur across biological activities that the framework does not identify as complete mapped events [24, 32–35, 42, 82, 90–92]. Their relevance to the identity proposition depends upon the event-level organization in which they participate.

The same constraint applies to dissipative consequences such as heat. A measurable energetic trace may provide evidence concerning the physical implementation of an event without constituting the event or its organism-relative inside view [33–35, 44, 112, 118, 121]. Friction Signatures therefore remain measurements of biological organization rather than fragments of phenomenology.

Nor does the term stochastic imply that variability generates awareness. Biological systems operate amid thermal fluctuation, probabilistic molecular behaviour, leakage, variable resources, and environmental noise [32, 108]. The relevant biological achievement is organized function under such variability, not variability itself. Greater noise therefore does not imply greater phenomenology.

Recruitment Magnitude Does Not Determine Phenomenal Magnitude

The necessity of energetic support must also be separated from any simple magnitude relation. Greater Pump recruitment does not necessarily imply greater phenomenal intensity, differentiation, or richness.

A prolonged regulatory condition may consume substantial resources while supporting repetitive or weakly differentiated content [12, 13, 21, 24, 120]. Intense muscular effort can require large metabolic expenditure without producing a corresponding increase in visual, auditory, or self-referential phenomenology [33–35, 92]. Inhibitory processes can be energetically demanding while reducing propagation or wider access [34, 64]. Restoration may remain metabolically active after the most salient phase of an event has ended [33–35, 78, 82, 90, 91]. Conversely, a brief sensory transition may be highly consequential to the organism while producing only a small alteration in total organismic expenditure.

Energetic magnitude alone does not specify the phenomenal organization proposed by the framework. The relevant distinction lies in the organization of the complete event: where work occurs, which systems are recruited, how long the transition persists, which variables are integrated, how the disturbance is organism-relatively valued, whether recursive reconstruction occurs, and how the event proceeds toward containment and resolution.

Anxiety may involve prolonged autonomic regulation, attentional narrowing, recurrent memory activation, future projection, and self-referential evaluation [12, 13, 21, 56, 69, 119, 120]. This organization may impose a greater cumulative regulatory burden than a brief neutral perception. It does not follow that anxiety contains more consciousness according to one universal scale. Meditative attenuation of recursive narration may reduce self-referential recruitment while preserving immediate sensory and bodily phenomenology and, in some conditions, altering its salience or reported intensity [36, 37, 43, 59]. A reduction in narrative demand cannot therefore be interpreted as a simple reduction in experience.

The relevant architecture is multidimensional. Phenomenal presence, qualitative differentiation, intensity, salience, ownership, temporal depth, recursive accessibility, and reportability may depend upon overlapping processes without varying together. The Stochastic Pump provides the proposed support organization through which these processes remain physically viable, but the total magnitude of Pump recruitment cannot substitute for analysis of the event's organization.

Maintaining the Levels of Description

The necessary role of the Stochastic Pump must not be interpreted as evidence for a hidden central engine. No structure stands outside the living system and directs every bounded event. Different organisms and events can recruit different implementations of the supporting architecture, and no single anatomical controller is required. The Stochastic Pump therefore names the proposed systems-level organization of distributed support rather than a miniature agent standing behind its components.

The Pump must also remain distinct from the Grind. The Pump implements and sustains the mapped event; it is not by itself the mapped event. The Grind includes the particular organism-relative transition organized around a disturbance: what is registered, which consequences persist, how those consequences are integrated with present condition and biological history, how the disturbance is valued, what commitment or transformation occurs, and how the system resolves.

The supporting architecture maintains and restores the conditions required for these relations but does not independently specify them. Substantially overlapping maintenance processes may support a visual perception, a painful sensation, an anticipated threat, a remembered loss, or an episode of deliberate planning [24, 27, 29, 33–35, 64, 68, 69, 90, 91, 114, 115]. The support functions overlap, but the events differ because different sensory systems, histories, valuations, temporal organizations, and available transformations are recruited.

The Pump therefore supplies biological capacity and continuity. The Grind is the event-specific organization of that capacity.

This distinction also prevents the continuing activity of the Pump from being identified with one temporally unbroken phenomenal event. The supporting biological work remains active between bounded transitions because it preserves general biological readiness [24, 33–35, 42, 90, 91]. The organism's life is continuous, but particular events remain distinguishable through their initiating conditions, retained consequences, transition trajectories, commitments, and modes of resolution. Continuous support does not imply one continuous mapped event.

Friction Signatures occupy a further level. They are convergent exterior measurements associated with the changing biological organization of the event. They are neither the Pump nor the event itself. Failure of one anticipated marker therefore does not establish absence of the proposed organization, but repeated failure across appropriately selected convergent measurements would count against the framework.

The final distinction is the most important. The Stochastic Pump does not produce the Glow as an additional object. If energy-dependent biological work were treated as a physical cause that generated a separate phenomenal product, the explanatory gap would remain. The framework would still need to explain how one ontological category produced another.

The mature proposal is different. The Glow is proposed as the organism-relative inside view of the complete bounded Grind. The Stochastic Pump belongs to the physical implementation through which that event remains organized. The relationship is not that the Pump completes its work and then presents a phenomenal result to an observer. No independent observer is required. The event occurs within a living system whose processing is already organized relative to its maintained condition, vulnerability, biological history, and available possibilities.

The Pump is necessary because the event cannot remain physically organized without maintenance, recruitment, coordination, containment, and restoration. It is insufficient because those functions, considered apart from the complete event, do not specify the organism-relative inside view.

Candidate Minimum Organization

The framework does not claim that the presently specified organization has yet been empirically demonstrated to be sufficient for phenomenology. Its current candidate mapped unit is the complete bounded organism-relative event.

At minimum, the candidate architecture includes selective registration of a consequential disturbance; persistence sufficient for that disturbance to affect subsequent processing; integration with the organism's present condition and retained biological history; organism-relative valuation; coordinated transformation or commitment; and biological resolution. Where continued viability permits, resolution ordinarily produces renewed or reorganized functional availability. These relations must be physically embodied within a living system whose maintained condition supplies the organism-relative context according to which the transition becomes consequential.

No individual feature is sufficient in isolation. Receptors register changes. Mechanical latches preserve states. Chemical networks integrate variables. Regulatory systems use thresholds. Motors perform work. Control systems restore selected variables. Formal fragments of the proposed architecture therefore occur widely in living and nonliving systems. The candidate organization concerns their coordinated relation within a bounded living transition, not the presence of any one operation detached from the rest.

Even this remains a theoretical proposal rather than an established biological law. Additional organization may prove indispensable. A particular form of integration, temporal persistence, recurrence, spatial distribution, causal propagation, network coordination, or other presently unresolved biological relation may be necessary for any inside view. The Venus flytrap may

satisfy the proposed minimum, approximate it, or instantiate only some of its necessary components. Comparative analysis constrains the location of the boundary; it does not settle that boundary by definition.

The necessary-but-not-sufficient distinction therefore protects the framework from two opposite errors. It prevents the physical support architecture from being inflated into a universal criterion for phenomenology, while also preventing phenomenology from being detached from the biological work required to sustain the candidate mapped event.

Partial Failure and Dissociation

The distinction becomes especially useful under perturbation because components and phases of the organization can fail selectively.

Local registration may remain while wider propagation is disrupted. Electrical signalling may persist while mechanical or behavioural output is blocked. Primary integration may remain while motor report is severed. Recursive self-reference may be attenuated while immediate sensory phenomenology remains. Metabolic support may become insufficient for sustained processing while brief local responses continue. Restoration may remain delayed even after externally visible behaviour appears normal [30, 31, 36–40, 43, 53–55, 59, 60, 73–75].

These cases require analysis of the complete architecture. The presence of some Pump-supported activity does not establish preservation of the full event, and failure of one output does not establish its abolition. The relevant question is which operations remain intact, which have been altered, and how the resulting trajectory differs from the intact condition.

This is particularly important in humans, where behaviour and report can dissociate from phenomenal organization. Failure of motor output does not by itself establish loss of phenomenology when the biological organization supporting the relevant conscious event remains intact. Conversely, local sensory reactivity does not establish preservation of a complete conscious or reportable state when the wider organization required by the candidate event has been substantially disrupted [30, 31, 39, 54, 60, 73–75].

The Stochastic Pump helps identify the physical support profile. Conclusions concerning the Glow, however, require assessment of the bounded event as a whole.

Empirical Obligations

A systems-level construct earns explanatory value only if it can be decomposed, measured, distinguished from alternatives, and revised or rejected [63, 64].

The Stochastic Pump would be weakened if its proposed organization could not be traced to identifiable biological operations. It would be weakened if those operations exhibited no coordinated relation to readiness, registration, persistence, transformation, containment, and restoration. It would be weakened if the term added nothing beyond the general observation that living organisms use energy. It would also be weakened if Friction Signatures tracked metabolism indiscriminately but could not distinguish target events from unrelated repair, movement, thermoregulation, digestion, or regulatory work [24, 33–35, 42, 112, 118–121].

The construct would require revision if biological operations shown to be necessary for the proposed maintenance-and-restoration function systematically fell outside its current functional decomposition, or if operations assigned a central role proved dispensable without compensatory implementation. Selective disruption of candidate support functions should alter the biological trajectory in phase-specific ways when those functions are genuinely causally limiting [63, 64, 77, 78, 90, 91, 113].

The identity proposition carries an additional burden. It would be strongly challenged if credible evidence of phenomenology remained after the candidate event architecture—as independently operationalized in advance—had been abolished or sufficiently disrupted across the operations the framework identifies as constitutive. It would also be challenged if reproducible phenomenal differences repeatedly occurred without distinguishable differences in the independently specified biological organization despite adequate spatial, temporal, metabolic, regulatory, dynamical, and causal measurement. Finally, it would be weakened if the framework could not distinguish a candidate mapped event from ordinary metabolism, repair, or regulation.

These obligations cannot be met by selecting one favourable biomarker after observing the result. Relevant dimensions, comparison conditions, temporal windows, perturbations, and expected trajectories should be specified in advance wherever possible. The framework must distinguish biological support from event specificity. The Pump may support many processes. The organization of the bounded event must supply the specificity.

Global metabolic impairment will affect many functions and may therefore be difficult to interpret. Selective perturbations are more informative because they can separate registration, persistence, propagation, integration, recursive access, behavioural expression, containment, and restoration [30, 31, 38–40, 53–55, 60, 63, 64, 73–75, 113]. The empirical goal is not merely to show that biological impairment changes behaviour. It is to identify which part of the proposed organization was altered and whether the resulting trajectory corresponds to the framework's prediction.

Proper Scope of the Construct

The Stochastic Pump therefore occupies a constrained but important position within the framework. It is broader than any one bounded event because it describes biological work preserving the living system's continuing capacity for consequential

transition. It is narrower than metabolism as a whole because it refers specifically to the proposed coordinated maintenance, recruitment, perturbation, containment, and restoration of the conditions required for bounded organism-relative events.

It is necessary to the Grind because such transitions cannot occur within a physically unsupported system. It is insufficient for the Glow because the support organization, considered apart from the complete event, does not specify organism-relative phenomenology.

Its scientific role is to connect the architecture of the bounded event to measurable biological work without reducing the event to energy magnitude, one anatomical location, or one universal biomarker. Its philosophical role is not to provide a hidden bridge between matter and mind. The construct instead locates the proposed inside view within a materially embodied living transition whose organization depends upon identifiable and empirically accessible physical processes.

The hierarchy established across this section can therefore be stated precisely.

Established biological mechanisms perform particular physical operations. Their coordinated event-relevant maintenance, recruitment, containment, and restoration constitute the systems-level organization described by the Stochastic Pump. That proposed organization supports and implements the bounded organism-relative Grind. Its changing recruitment is approached externally through Friction Signatures. The Glow is proposed as the organism-relative inside view of the complete Grind.

None of these levels can be substituted for another. The components are not the systems-level organization. The systems-level organization is not the complete event. The measurements are not the process they measure. The inside view is not a separate product added after the biological transition has occurred.

Section 6 has therefore established a physical support architecture without converting that architecture into a universal consciousness mechanism. The Stochastic Pump provides a proposed systems-level account of how a living system remains capable of consequential, temporally extended, and repeatable state-transitions under continual noise, leakage, resource limitation, and environmental disturbance [24, 32, 108]. It does not independently determine which bounded organizations are sufficient for a minimal inside view, how those organizations vary across living systems, or which additional capacities arise as differentiation, retained history, recurrence, psychological time, and recursive ownership increase.

The remaining question is therefore not whether living systems expend energy, but which relations within the bounded organism-relative architecture remain conserved across biological organization, which additional forms of integration and recurrence emerge with increasing biological complexity, and which of those relations ultimately prove necessary or sufficient for an inside view.

7.0 From Basal Regulation to Recursive Selfhood

7.1 Phylogenetic Scaling of the Architecture

A biologically continuous framework cannot begin with the human narrator as though the processes supporting consciousness appeared fully formed with the cortex. It must distinguish ancient regulatory and integrative organization shared across living systems from the increasingly rapid, differentiated, and flexible organism-level integration enabled by nervous systems, and from the still later memory-dependent recursive capacities associated with self-reference [67, 69, 96, 102, 107, 128, 129].

At the cellular level, life already requires a maintained boundary, internal regulation, energetic self-preservation, sensitivity to changing conditions, and action relative to organism-level consequences [24, 32, 131]. These capacities do not by themselves establish phenomenology or a psychological self. They provide the basal biological architecture through which conditions acquire differential significance relative to a bounded living organism.

The purpose of phylogenetic scaling is therefore not to project human awareness onto every cell. It is to identify continuity across distinct levels of organization: basal regulation and organism-relative valuation, increasingly coordinated organism-level integration, and finally the recursive self-reference of the human narrator. The architecture should explain how later layers emerge from and depend upon earlier biological functions without treating those layers as equivalent.

7.2 Basal Identity: Boundary, Regulation, and Organism-Relative Value

The most elementary form of biological identity is not a psychological self but a maintained distinction between organism and environment. A living cell preserves a bounded internal organization through membrane regulation, metabolism, repair, and continual exchange with its surroundings. This boundary is dynamic rather than absolute: material and energy cross it, but their movement is regulated in relation to the continued organization of the cell [24, 32, 131].

Because the organism must maintain particular internal conditions, environmental changes are not biologically neutral. A chemical gradient, nutrient source, toxin, temperature shift, or mechanical disturbance can have different biological consequences according to its relation to the organism's viability, current condition, and regulation [24, 32, 131]. This organism-relative differentiation does not require conscious judgment or a narrator. It is expressed through altered internal states and state-dependent regulatory or behavioural responses.

Empirically, such organization establishes that environmental conditions can produce different biological consequences according to the organism's maintained state. Within the present framework, this state-dependent differential organization is termed basal biological valuation. The term does not imply conscious judgment, preference, or an internal evaluator. Together with the maintained organism-environment boundary, it establishes the biological standpoint upon which increasingly coordinated integration and, eventually, recursive self-reference can develop. These capacities should not by themselves be equated with phenomenology or self-awareness.

7.3 Memory and Adaptive Resolution Without a Nervous System

Organisms without nervous systems can alter their responses according to prior conditions. The unicellular ciliate Stentor coeruleus progressively reduces its contraction response to repeated mechanical stimulation while remaining responsive to stronger stimuli [122]. The non-neural plasmodial organism Physarum polycephalum likewise exhibits habituation, history-dependent foraging, and adaptive reorganization in response to environmental conditions [123–125].

At this basal level, the relevant continuity is retained biological history rather than conscious recollection or an explicit representation of the past. Previous interactions can leave persistent physical changes that alter the organism's present condition and thereby modify its response to subsequent conditions [122–125]. Current action can therefore depend not only upon the immediate stimulus but also upon changes retained from earlier encounters.

Within the framework, these capacities demonstrate that temporal retention, state-dependent response selection, and organism-relative valuation do not require an L2 narrator. They do not, by themselves, establish phenomenology or self-awareness. Rather, they show that nervous systems elaborate ancient biological capacities for retaining state, differentiating consequences, and modifying action—capacities later incorporated into increasingly coordinated organism-level integration and, in some lineages, into memory-dependent comparison, autobiographical organization, and recursive self-reference.

7.4 Anesthetic Sensitivity Beyond Nervous Systems

General anesthetics can alter cellular and behavioural processes in organisms lacking nervous systems. In ciliates such as Tetrahymena pyriformis, volatile anesthetics reversibly reduce swimming activity [126]. Propofol exposure has also been associated with altered food-directed behaviour in the non-neural plasmodial organism Physarum polycephalum, although the available experiments do not yet distinguish a specific effect on learning or memory from other effects such as chemical aversion [127]. These findings establish that anesthetic sensitivity is not restricted to neurons or cortical networks [126, 127].

The resulting states must not be treated as functionally equivalent across species. Reduced ciliate motility does not establish loss of phenomenology, just as altered behaviour in Physarum does not demonstrate human-like unconsciousness or amnesia. General anesthetics can affect biological processes outside nervous systems, but those effects are incorporated into radically different levels of biological organization [126, 127].

Cross-substrate anesthetic sensitivity therefore shows that some anesthetic-sensitive biological organization exists outside nervous systems. It does not establish that identical molecular mechanisms explain anesthetic-induced unconsciousness across species, nor that behavioural suppression in a non-neural organism is equivalent to loss of consciousness. In humans, loss of reportable consciousness is associated with disruption of coordinated neural dynamics operating within a much more differentiated biological architecture [38–40, 50, 54, 55]. The evidence therefore constrains accounts that treat anesthetic action as exclusively cortical while leaving phenomenology at non-neural scales an open empirical question.

7.5 From Basal Regulation to Phenomenological Integration

Basal regulation, retained biological history, and organism-relative valuation establish biological continuity, but they do not by themselves establish phenomenology. Organisms without nervous systems can already coordinate activity across cells and tissues, while nervous systems greatly increase the speed, differentiation, spatial reach, recurrence, and flexibility with which sensory, internal, and behavioural processes can be coordinated across the organism [65, 66, 95, 128, 129].

The evolutionary contribution of nervous systems is therefore not the invention of organism-relative significance or integration as such. It is the elaboration of these older capacities into increasingly differentiated and dynamically sustained organism-level states. Distributed nerve nets can organize distinct whole-body behaviours, while even compact nervous systems exhibit coordinated population dynamics through which sensory conditions, internal state, retained history, and alternative actions can be integrated across time [128, 129].

Within the present framework, L1 should not be identified with simple responsiveness, cellular signalling, or the presence of neurons alone. The candidate domain for L1 is the sufficiently complete bounded organism-relative state-transition defined earlier. Nervous systems provide powerful evolutionary means of increasing the speed, differentiation, recurrence, spatial coordination, and flexibility of such integration, but their presence is neither stipulated as sufficient for phenomenology nor defined in advance as necessary for it. Where phenomenology first appears along this evolutionary continuum therefore remains an open empirical question. The architectural claim is narrower: increasingly elaborate biological systems can build upon ancient regulatory and integrative capacities without requiring the recursive self-reference of an L2 narrator.

7.6 Organism-Relative Architecture in Animal Cognition

A central insight of the framework is that there is no view from nowhere in biological cognition. Every biologically operative memory, learned association, and instance of cognition is structured through relations to the organism's own condition and possibilities. A remembered food location or learned danger cue need not be propositionally represented as "good for me" or "threat to me." These phrases are used here as organism-relative shorthand for the biological significance acquired through the relation among retained information, present condition, and available action. Organism-relative reference does not imply an explicit concept of self or a human narrator. This framing is not an optional addition; it is an architectural necessity if retained information is to acquire adaptive biological significance for a living organism.

This organism-relative structure is demanded by the biology of adaptive cognition itself. For any organism to act adaptively, incoming signals and stored traces must be evaluated relative to its own current state, needs, vulnerabilities, prior history, and available responses [24, 96, 97, 131]. There is no neutral computational standpoint available—all processing occurs within the organism's own metabolic and sensory envelope. Biologically operative cognition therefore does not acquire significance independently of the living system whose state and possibilities it alters.

In animals, this organism-relative architecture is implemented through increasingly differentiated neural, ionic, metabolic, vascular, and regulatory processes that support event-relevant maintenance, integration, coordinated state change, and restoration [24, 33–35, 90, 91, 111, 112]. Within the present framework, the systems-level organization of this ongoing biological work is described by the Stochastic Pump. At the candidate L1 level, these processes support the energetic and temporal organization through which biologically consequential bounded transitions can be completed. Where a complete transition satisfies the candidate identity conditions, its organism-relative inside view belongs to the bounded event as a whole. As organism-relative shorthand, this minimal non-neutral registration may be expressed as "this matters to me." The phrase denotes biological significance relative to the organism; it does not imply a literal proposition represented by the animal or identify phenomenology with metabolism considered in isolation.

This foundational organism-relative organization enables associative learning, spatial memory, avoidance of previously dangerous stimuli, and affectively weighted responses to food, predators, conspecifics, and environmental conditions [96, 97, 130, 132–135]. The animal is not adequately described as a simple stimulus-response device. Its present response can depend upon retained biological history, learned value, current internal state, and available action, such that the same external condition can have different biological consequences for the same organism under different conditions.

For example, when a squirrel caches nuts in multiple specific locations and later retrieves them with high accuracy, the retained spatial information is not biologically operative as a neutral environmental fact detached from the animal's condition [130]. Its organism-relative significance can be expressed in the shorthand already defined: "these locations contain resources for me at a later time." No narrator need silently formulate that proposition. Its biological meaning is carried by the relation among retained spatial information, current motivational state, prior action, and later retrieval.

The same organism-relative principle is expressed in conditioned taste aversion, predator avoidance, homing behaviour, resource tracking, and social learning across diverse species [132–135]. In each case, retained information has adaptive force because its biological consequences are organized in relation to the organism's present condition, prior history, and available actions. Within the organism-relative identity proposition, where these relations participate in a sufficiently complete bounded biological transition, the Glow is not an additional product generated by the dissipative work. It is the organism-relative inside view of that organized transition itself.

This perspective makes explicit an architectural consequence that is often left implicit in task-level descriptions of animal cognition. Extensive empirical work characterizes memory, learning, discrimination, valuation, navigation, and behavioural selection [96, 97, 130, 132–135], while theoretical traditions such as enactivism have likewise emphasized organism-specific significance and biological normativity [131]. The present framework makes a further relation explicit: biologically operative cognition must be organized relative to the living organism because only relations to its maintained condition, history, vulnerabilities, and available actions can acquire biological consequence. This organism-relative organization is therefore an architectural necessity rather than an optional interpretive overlay. The framework then carries that organization forward into the bounded state-transition proposed as the candidate mapped unit.

Within the organism-relative identity proposition, animal consciousness is therefore neither an insoluble mystery nor a mere behavioural illusion. It becomes a constrained biological prediction rather than something inferred from behaviour alone. If an animal transition satisfies the relevant bounded organization, that transition is predicted to possess an organism-relative inside view. Comparative evidence can constrain where those conditions are present, absent, or incomplete without independently establishing the phenomenal boundary in non-reporting species. The relevant architecture may be implemented through increasingly differentiated excitable membrane dynamics, ion-channel activity, metabolic and regulatory support, temporal integration, memory, representation, and, where present, recursive depth; no single component is sufficient in isolation [33–35, 64, 90, 91, 96, 97, 103, 128, 129].

What appears in humans as the rich, narratively elaborated self is built upon the same foundational organism-relative architecture already present in animal cognition. The proposed architectural continuity proceeds from temporally integrated organism-relative state-transitions in the Venus flytrap, through increasingly differentiated memory, learning, and adaptive valuation in animals, to the recursive L2 narrator in humans. This continuity does not flatten biological difference or fix the phenomenal boundary by definition.

The framework therefore proposes continuity in the biophysical organization of organism-relative processes rather than requiring a sudden ontological leap.

7.7 The Evolutionary Emergence of the Narrator

The L2 narrator is not an extension of basal cellular identity in any simple sense. It is a later recursive organization built upon organism-relative phenomenology, retained history, memory-dependent comparison, self-monitoring, and temporal organization. Whereas basal biological identity distinguishes organism from environment and the candidate L1 domain concerns the complete organism-relative event, L2 reprocesses present and reconstructed content through attribution, comparison, ownership, and self-reference around a persistent virtual reference point.

Increasingly differentiated capacities for memory-dependent comparison, prediction, behavioural monitoring, and representation provide prerequisites for progressively more elaborate forms of self-referential organization [68, 96–99, 102, 107]. In humans, social attribution, language, autobiographical memory, and repeated self-indexing further stabilize the virtual reference point through which events can be organized as "what happened to me," "what I am," and "what may happen to me." [5–10, 69, 96, 99, 102, 107] The narrator therefore depends upon capacities that are evolutionarily and developmentally later than basal regulation and primary organism-relative processing. The present phylogenetic argument does not require specification of the precise evolutionary point at which a human-like narrator emerged.

Within the framework, this progression establishes a constrained phylogenetic hierarchy: basal regulation establishes organism-relative differentiation; sufficiently complete integrated organism-relative transitions constitute the candidate domain for L1; and L2 adds memory-dependent recursive attribution, ownership, evaluation, and report around a temporally extended virtual reference point. The human narrator is therefore neither the origin of biological value nor a bearer that must exist before phenomenology can occur. It is a late recursive organization built upon processes that preceded it.

This phylogenetic scaling preserves biological continuity without collapsing basal regulation, candidate phenomenological integration, and recursive selfhood into the same process. Phylogenetic ordering alone, however, does not establish the temporal relation between primary organism-relative processing and recursive ownership within a mature nervous system. That relation requires a separate analysis of the physical ordering through which primary events and later recognition, attribution, and report can be distinguished.

8.0 System Latency and the Downstream Narrator

8.1 The Mechanical Basis of System Latency

The objective of this section is to define the physiological basis of System Latency (t_s) as the unavoidable non-zero temporal interval separating primary organism-relative registration and resolution from the later recursive operations through which an event becomes recognized, compared, interpreted, and attributed to an apparent owner. These operations are architecturally distinguishable but biologically recurrent and overlapping; they should not be understood as two isolated processes connected by a single transmission pathway.

System Latency does not generate phenomenology or create the narrator. It establishes the temporal geometry of the system and exposes narrator-level recognition and ownership as structurally downstream from the primary event. The biological state must already have undergone transmission and sufficient integration before it can be remembered, labeled, compared, and represented as happening to "me." [90, 91, 96, 104, 106, 136, 137]

The apparent presence of the "me" is therefore not evidence of an observer that existed prior to the event. It is a later interpretive construction generated and maintained through recursive biological processing and psychological time.

8.2 Definitions of the System Layers

Primary Integration Layer (L1): The Resolution Engine

The Primary Integration Layer is the organism-relative biological architecture through which consequential state-change is registered, integrated, valued, and resolved. Its inside view is raw phenomenology prior to narrator-level recognition, ownership, and report. L1 is therefore not merely sensory input or passive hardware. It includes the electrical, ionic, metabolic, regulatory, and integrative processes through which a perturbation becomes biologically significant for the living system undergoing it.

L1 is a functional level rather than a single anatomical location. In humans, it is implemented through distributed sensory, subcortical, thalamocortical, interoceptive, metabolic, and regulatory systems whose relative contribution varies with the event being registered [23, 33–35, 64, 90, 91, 106]. In the Venus flytrap, the same foundational principle is expressed through the excitable biological architecture connecting trigger-hair stimulation, electrical and calcium signalling, temporal integration, threshold crossing, energetic deployment, and the coordinated snap response [65, 66, 77–86].

Within the framework, L1 integrates organism-relative changes through temporally extended biological dynamics until the conditions for a bounded resolution are met. Where threshold accumulation is involved, the relevant activity must reach the Magnitude Threshold (M_θ) before the system can complete the corresponding state transition. The resulting Identity Resolution is not restricted to overt movement. It refers more generally to the organized biological resolution through which the organism's state is altered in response to a consequential perturbation.

At this level, valuation refers only to organism-relative differential biological significance expressed through state-dependent processing and resolution. It does not imply conscious judgment, representational evaluation, or psychological time. A stimulus matters biologically through its relation to the organism's present condition and organization, with different conditions producing different regulatory, orienting, defensive, or other state-dependent consequences [22–24]. For example, a sudden unfamiliar noise may produce orienting, autonomic activation, or defensive readiness before thought identifies the sound and says, "That may be dangerous to me." [22–24] The initial significance is therefore already expressed through the organism's sensory, metabolic, and regulatory processes before the event is recognized at narrator level or represented as happening to "me."

L1 therefore constitutes the primary organism-relative inside view of the event: phenomenology before it is remembered, labeled, compared, attributed to "me," or made available for report.

Secondary Audit Loop (L2): The Recursive Audit Layer

The Secondary Audit Loop is the distributed recursive biological organization through which primary registrations are accessed, remembered, compared, interpreted, projected, attributed, and prepared for report. L2 is not a separate observer monitoring a completed output from L1. It is a recurrent process that operates upon prior biological registration while also feeding back into the organism's subsequent state.

L2 includes the material processes of memory retrieval, labeling, comparison, judgment, projection, and autobiographical organization [5–10, 68, 69, 96–102, 107]. These operations do not occur from a neutral standpoint outside the organism. Every retained trace is encoded and reactivated in relation to the organism's own history, condition, and adaptive demands. While inactive, a retained trace remains part of the organism's biological history; it becomes active psychological time only when it is re-entered into present processing as thought. When memory becomes active as thought, it carries the past into the present and may project from that past toward possible futures; in this sense, thought is psychological time. Through recursive organization of this organism-relative temporal movement, the system generates and maintains the virtual continuity of "me."

The narrator is therefore not an already existing agent that performs the audit. Recursive biological processing through memory, comparison, valuation, and projection—thought operating as psychological time—generates and maintains the narrator as a virtual reference point. Through this organization, present registration becomes interpreted as "my experience," linked to an autobiographical past, and projected toward an anticipated future.

Critically, the recursive audit can generate internal stimuli of its own. Worry, rumination, remembered threat, imagined loss, self-comparison, and anticipated danger can alter present physiology even in the absence of a new external event [12, 13, 16, 21, 114, 115, 117, 119, 120]. These internally generated representations feed back into subsequent L1 activity, where they may amplify, suppress, redirect, or prolong organism-relative registration and resolution. The resulting sequence is recurrent:

$$L1\ registration \rightarrow L2\ interpretation \rightarrow internally\ generated\ stimulus \rightarrow altered\ L1\ state \rightarrow renewed\ L2\ audit$$

This recursive work requires additional biological activity and produces measurable Friction Signatures across metabolic, thermodynamic, network, temporal, and autonomic domains [12, 13, 16, 21, 33–35, 42, 44, 90, 91, 112, 118–121]. Relevant empirical proxies may include changes in cerebral glucose utilization and blood flow within self-referential networks, local energetic demand from ATP hydrolysis and ion pumping, altered heart-rate variability, increased skin conductance, and broader allostatic cost during sustained recursive processing [12, 16, 21, 33–35, 42, 44, 90, 91, 112, 118–121].

These Friction Signatures are the measurable outside-view expressions of the recursive biological activity. The organism-relative inside view of the same recursive activity constitutes its contribution to the felt character of experience, while the virtual narrator organizes, interprets, and claims that experience as happening to "me."

L1 and L2 are therefore architecturally distinguishable but recurrently coupled. L1 provides primary organism-relative registration, valuation, integration, and resolution. L2 recursively remembers, compares, projects, and attributes those states, while its outputs modify the biological conditions from which further L1 registration arises.

8.3 The Temporal Derivation of System Latency

In any biological nervous system, signal propagation, synaptic transmission, distributed integration, recurrent processing, memory-dependent recognition, attribution, and report require non-zero time [90, 91, 96, 103, 104, 107, 136, 137]. System Latency ($t\ s$) refers to the unavoidable temporal interval between sufficient primary organism-relative integration at L1 and the later recursive availability of that event at L2.

This interval should not be understood as the transmission time between two isolated biological boxes. L1 and L2 are recurrently coupled and may overlap in their ongoing activity. The relevant distinction is temporal and functional: the event must first undergo sufficient biological registration, valuation, integration, and resolution before it can become available for recursive recognition, comparison, ownership, and report.

Let:

$$t\_L1$$

denote the reference time at which sufficient L1 integration and resolution have occurred for the event under analysis.

Let:

$$t\_L2$$

denote the earliest time at which that event becomes recursively available for L2 recognition, comparison, attribution, or report.

System Latency is therefore defined as:

$$t\_s = t\_L2 - t\_L1$$

Because the physical processes required for recursive availability cannot occur instantaneously:

$$t\_s > 0$$

Equivalently:

$$t\_L2 = t\_L1 + t\_s$$

The magnitude of $t\ s$ is not assumed to be universal or fixed. It may vary with sensory modality, stimulus strength, attention, arousal, network state, memory demand, and the form of recognition or report involved [22, 64, 96, 107, 136, 137]. The framework requires only that the interval remain non-zero.

The mechanical consequence is decisive: narrator-level recognition and ownership are structurally downstream from the primary event. The later L2 representation may interpret, reconstruct, and claim the event, but it cannot be identical to the L1 registration from which it arose.

8.4 System Latency and the Illusory Gap

The explanatory gap is not generated by System Latency itself. System Latency exposes the structural condition under which the gap is misformulated: narrator-level recognition occurs only after the primary event has already undergone sufficient organism-relative registration, valuation, integration, and resolution at L1.

By the time the event becomes recursively available at L2, it is no longer encountered in its primary form. It has already been biologically processed, transformed, and integrated. L2 then reconstructs, compares, interprets, and attributes that event through memory and psychological time.

For example, when a person encounters a beautiful sunset, the narrator does not directly encounter the initiating optical event. Light reflected and emitted across the scene is transduced at the retina and transformed through successive stages of neural transmission, integration, valuation, and perceptual organization [29, 64, 106, 136, 137]. Only after this processing has occurred can L2 recognize the event as "a sunset," compare it with retained memory, judge it as beautiful, and represent it as "I am seeing a beautiful sunset." The narrated experience is therefore not the untouched primary event. It is a recursively reconstructed and self-attributed representation of an organism-relative registration that has already occurred.

As established in Section 8.3:

$$t\_s = t\_L2 - t\_L1$$

and:

$$t\_s > 0$$

Narrator-level recognition therefore cannot be temporally identical with the primary biological event it later interprets and claims. Relative to that event, the narrator is mechanically confined to a past-tense perspective. It can only recognize what has already undergone sufficient processing to become available for recursive interpretation.

This past-tense position does not make the narrator causally inert. Once generated, its interpretations, judgments, memories, and projections can alter present physiology and shape subsequent L1 activity [12, 13, 16, 21, 114–117]. Its lateness concerns the event it claims to own, not its capacity to influence what follows.

Non-zero transmission delay does not by itself explain phenomenology. It does, however, establish that narrator-level subjectivity is temporally downstream from primary phenomenology. The narrator therefore cannot serve as the primitive explanatory target to which phenomenology must be mapped.

This is a deconflation argument grounded in empirical biology. The structural delay separates primary phenomenology from its later recognition, ownership, interpretation, and report. What is ordinarily treated as "the subject" is thereby exposed as a downstream representational construction rather than the original experiencer.

The structural lag therefore does not generate phenomenology; it exposes the narrator as a delayed interpretive construction. The apparent explanatory gap arises when this downstream construction mistakes its reconstructed, labeled, and self-owned representation for the primary organism-relative inside-view event. The corresponding perspective error consists in projecting the late-arriving narrator backward and treating it as the original experiencer.

8.5 The Virtual Narrator and the Zero-Remainder Result

The temporal analysis establishes that narrator-level recognition and ownership are downstream from the primary inside-view event. The remaining question is whether an additional observer or experiencer must be added to the architecture once L1, L2, and their recurrent interaction have been accounted for.

Within the framework, the complete architecture of consciousness is expressed schematically as:

$$\text{Total consciousness} = \text{L1 inside view} + \text{L2 recursive audit}$$

This is an architectural accounting identity, not a claim of simple numerical addition. L1 and L2 are recurrently coupled biological operations. L1 provides organism-relative registration, integration, and resolution, whose inside view is raw phenomenology prior to narrator-level ownership and report. L2 provides the recursive organization through which those states are remembered, compared, interpreted, projected, attributed to "me," and made available for autobiographical continuity and report.

Once these processes and their recurrent interaction are fully accounted for, no additional observer remains outside the architecture:

$$\text{Additional independent experiencer} = 0$$

This is the Zero-Remainder Result. The zero does not mean that L1 disappears when L2 is absent, nor that the recursive audit is biologically unreal. It means that no separate owner, witness, or experiencer remains to be added after the organism-relative inside view and its recursive organization have been explained.

The narrator is biologically real as a recursively maintained representation and causally consequential process, but it has no independent ontological status as the observer, owner, or author it represents. Thought operating as psychological time generates and maintains this virtual reference point by organizing memory, comparison, judgment, and projection around the continuity of "me." Once generated, these representations feed back into subsequent biology, producing internal stimuli and altering later L1 registration and resolution.

The biological implementation and maintenance of this recursive organization require additional energetic and regulatory work, expressed externally through measurable Friction Signatures [12, 13, 16, 21, 33–35, 42, 90, 91, 119, 120]. The narrator is therefore not an inert illusion. It is a metabolically sustained construction whose recursively generated evaluations—operating through thought as psychological time—can become internal stimuli that alter present physiology and subsequent L1 registration. Its causal influence arises from this biological feedback loop; it does not transform the narrator into an independent experiencer standing behind the system.

General anesthesia provides a powerful reversible test of this distinction. When anesthesia sufficiently suppresses the recurrent biological organization required for L2, narrator-level access, ownership, autobiographical continuity, memory formation, and report are jointly lost. As that organization recovers, these functions return [38–40, 50, 55, 74, 75]. Some L1-level organismic registration, regulation, and biological resolution may nevertheless continue during the suppressed state [60, 74, 75]. What is removed is the full recursive organization through which phenomenology becomes remembered, self-owned, and reportable as "my experience."

Local anesthesia or cooling-induced conduction block exposes the architecture from the opposite direction. The broader L1–L2 system remains active: the narrator, memory, ownership, and capacity for report continue. However, conduction from a selected region is interrupted before the corresponding perturbation can enter the central integration required for its ordinary L1 resolution as pain. Local anesthetic drugs achieve this primarily by blocking action-potential propagation in affected peripheral nerves [138], while sufficiently strong cooling can slow or interrupt the ion-channel dynamics required for normal conduction [139].

The two interventions therefore produce a functional double dissociation. Under sufficient general anesthesia, the recursive owner is suppressed while some foundational biological processing remains [38–40, 50, 60, 74, 75]. Under local anesthesia or cooling-induced conduction block, the recursive owner remains while a selected perturbation is prevented from undergoing its ordinary central phenomenal resolution [138, 139].

This reversal constrains the narrator from both directions. Its presence is not necessary for every organism-relative biological resolution, and its continued presence is not sufficient to produce a particular phenomenal event when the required biological pathway has been interrupted. The narrator is therefore neither the source nor the independent owner of phenomenology. It is a downstream, recursively maintained construction operating within—and dependent upon—the same biological architecture it later claims as "my experience."

The Zero-Remainder Result follows: L1 accounts for the primary organism-relative inside view; L2 accounts for its recursive interpretation, ownership, autobiographical organization, and report. Nothing further remains that must be assigned the role of an independent experiencer.

9.0 Friction Signatures as Empirical Access to the Bounded Event

9.1 Friction Signatures and the Inside View

The objective of this section is to define Friction Signatures as measurable biophysical expressions of the work involved in organism-relative registration, integration, valuation, and bounded biological resolution. The framework does not propose that metabolic cost is converted into phenomenology, or that a Friction Signature is first produced and then internally detected as experience.

Glow and Grind are not two products linked by conversion. The Grind is the bounded biological process itself; the Friction Signature is its measurable biophysical expression, and the Glow is its organism-relative inside view.

Phenomenal intensity is therefore examined not as an additional property attached to physical activity, but as the inside-view expression of the magnitude and organization of biologically consequential resolution. Metabolic cost is a necessary component of this process, but it is not treated as a complete or independent measure of phenomenal intensity. The relevant biological organization may also include temporal integration, network coordination, ionic and electrical activity, autonomic regulation, and the degree of organism-relative significance arising through the event's relation to the organism. [23, 24, 33–35, 42, 64, 90, 91, 120]

9.2 Phenomenal Intensity and Biological Cost

Phenomenal intensity is often described from the first-person side while the biological organization supporting it is treated separately. Within this framework, that separation is rejected. The felt intensity of an event belongs to the same bounded biological resolution as the metabolic, electrical, ionic, network, and regulatory work through which the event is registered and resolved.

Phenomenal intensity is therefore not defined as the internal detection of metabolic cost, nor is metabolic cost converted into feeling. It is the organism-relative inside-view expression of the magnitude and organization of biologically consequential resolution. The corresponding Friction Signature is the measurable biophysical expression of that same process.

Metabolic and thermodynamic cost remain necessary components of the relation. Greater recruitment, sustained ion pumping, recurrent activity, autonomic regulation, and prolonged state maintenance all require biological work and may accompany greater phenomenal intensity. [12, 13, 21, 33–35, 42, 90, 91, 120] However, total energy expenditure alone does not determine how intense an event feels. The organization of the activity also matters, including its temporal integration, network coordination, recurrence, valuation, and significance for the organism.

Two processes may therefore carry similar overall metabolic costs while differing substantially in phenomenal intensity, quality, or valence. Conversely, an event may be experienced as highly intense because a comparatively bounded biological change acquires exceptional organism-relative significance through its relation to the organism's present organization.

The framework consequently predicts a constrained relation rather than a simple one-to-one conversion between energetic cost and felt intensity.

There is no additional phenomenal property attached after the biological work has been completed. The Grind is the organized biological resolution itself; the Friction Signature is its measurable biophysical expression, and phenomenal intensity is a dimension of its organism-relative Glow.

9.3 Integration and Constraint During Bounded Resolution

Biological resolution occurs within a living system whose energetic, temporal, and regulatory capacities are finite. [24, 33–35, 42, 90, 91] At L1, sensory, interoceptive, metabolic, and regulatory activity must become sufficiently organized for the organism to complete a bounded Identity Resolution. Where threshold accumulation governs the event, this organization must satisfy the relevant Magnitude Threshold ($M\ \theta$) before the corresponding state transition can be completed.

L1 resolution may be distributed, recurrent, and temporally extended. The constraint arises because the organism must integrate consequential change while maintaining viable biological organization. Competing signals, prior state, valuation, inhibitory control, metabolic availability, and the urgency of the perturbation all shape how that resolution unfolds. [22, 24, 34, 56, 57, 64, 68, 90, 91]

The required integration depends upon electrical transmission, ion-channel activity, membrane restoration, ATP-dependent pumping, network coordination, autonomic regulation, and the maintenance or reorganization of the organism's state. [24, 33–35, 42, 64, 90, 91, 111] These processes require measurable energetic and regulatory work. [33–35, 42, 90, 91] The amount and pattern of that work vary with the type of event, its duration, its organism-relative significance, and the degree of recurrence required for resolution.

The measurable expression of this constrained biological work is a multidimensional Friction Signature. Relevant components may include metabolic demand, glucose and oxygen utilization, ATP turnover, ion-pumping activity, local heat production, entropy production, network organization, temporal persistence, autonomic change, and broader allostatic cost. [12, 21, 33–35, 42, 44, 90, 91, 112, 118–121] No single component is assumed to provide a complete measure of the resolution.

These measurable changes are not incidental correlates. They express how bounded biological resolution is physically organized under finite energetic, temporal, and regulatory constraints. Friction Signatures therefore provide measurable access to the organization of the same bounded biological event mapped by the framework to the organism-relative inside view.

9.4 Comparative Friction Signatures: Stable Perception and Ruminative Anxiety

To illustrate how differences in biological organization should produce different Friction Signatures, the framework compares stable perception with sustained ruminative anxiety. Both states involve real biological work and an organism-relative inside view. The difference lies not in one being physical and the other subjective, but in the degree, duration, and organization of recursive re-entry.

Case A: Stable Perception

When the organism perceives a stable object, L1 performs the necessary work of sensory registration, valuation, integration, and bounded resolution. [29, 33–35, 64, 106, 136, 137] L2 may then recognize, name, compare, and attribute the event, but this recursive activity remains comparatively brief, task-relevant, and non-self-perpetuating. The event is resolved without repeated projection, resistance, or internally generated threat.

The resulting Friction Signature is therefore expected to remain relatively bounded and temporally stable. This does not mean that perception is biologically effortless or metabolically insignificant. It means that the foundational work of L1 is accompanied by limited recursive overhead and little sustained re-entry through psychological time.

Case B: Sustained Ruminative Anxiety

Ruminative anxiety begins with an organism-relative state that may include genuine threat valuation, uncertainty, or autonomic activation. [12, 13, 21, 56, 57, 120] The biological response is then repeatedly re-entered through memory, comparison, anticipation, resistance, and self-referential projection. [12, 13, 21, 69, 114, 115, 117, 119] Thought operating as psychological time reconstructs what has happened, imagines what may happen, and organizes both around the virtual continuity of "me."

These recursively generated evaluations become internal stimuli that alter present physiology and subsequent L1 registration. [12, 13, 16, 21, 114, 115] The resulting biological state is then interpreted again by L2, producing further memory, projection, and evaluation. The process becomes self-sustaining:

$$L1\ registration \rightarrow L2\ evaluation \rightarrow internally\ generated\ stimulus \rightarrow altered\ L1\ state \rightarrow renewed\ L2\ evaluation$$

The Friction Signature of sustained ruminative anxiety is therefore predicted to be broader and more persistent than that of stable perception. Expected differences may include prolonged temporal recurrence, altered self-referential network activity, increased autonomic and allostatic demand, sustained metabolic and regulatory work, and repeated reorganization of the organism's state. [12, 13, 16, 21, 69, 117, 119, 120]

The felt urgency, pressure, constriction, agitation, or "sting" of psychological suffering is not produced by a Friction Signature as a separate intermediate object. It is the organism-relative inside view of the recursively sustained biological state, while the narrator organizes and claims that state as "my anxiety."

The comparison therefore isolates the role of recursive amplification. Stable perception involves substantial foundational L1 work but limited self-generated re-entry. Ruminative anxiety adds repeated recursive evaluation and internally generated stimulation, prolonging and reorganizing the biological process. [12, 13, 21, 114, 115, 117] The framework accordingly predicts not a simple increase in total energy use, but a distinct multidimensional Friction Signature defined by persistence, recurrence, self-referential organization, autonomic load, and organism-relative significance.

9.5 Taming the Brute Fact

The Brute Fact is commonly framed as the question of why a physical process should feel like anything at all. That formulation appears unavoidable only if the physical process and phenomenology are treated as two independently existing products, with the second somehow generated from the first.

Within this framework, no such conversion is proposed. A bounded organism-relative biological resolution is not first completed as a wholly non-phenomenal event and then supplemented with feeling. The Grind is the organized biological process itself, while the Glow is that same process from the organism-relative inside view. The explanatory problem therefore does not consist in identifying an additional mechanism that transforms physical activity into phenomenology.

This identity claim is not intended as an unsupported declaration that experience is simply "brain activity." The Mapping Theorem constrains the biological class of events to which the claim applies by specifying the relevant organization of bounded integration, valuation, resolution, temporal structure, metabolic dependence, and organism-relative significance. Friction

Signatures provide measurable access to that organization across metabolic, thermodynamic, network, temporal, autonomic, and regulatory dimensions. [12, 21, 33–35, 42, 44, 90, 91, 112, 118–121]

The explanatory task is therefore reformulated. The question is no longer how a completed non-phenomenal process produces a separate phenomenal property, but which biological organization constitutes a bounded organism-relative process whose inside view is phenomenology. This shift removes the assumed conversion step while preserving a substantive empirical burden: the proposed mapping must identify measurable conditions, distinguish relevant from irrelevant biological activity, and remain vulnerable to falsification.

L2 recursively accesses an event that has already undergone sufficient organism-relative registration and resolution at L1, then remembers, compares, labels, attributes, and prepares that event for report as "my experience." [90, 91, 96, 104, 107, 136, 137] Narrator-level ownership is therefore a downstream organization of the event within the organism, while Friction Signatures provide measurable access to the biological process itself.

The Brute Fact is therefore tamed not by adding an unexplained phenomenal product to biological activity, but by exposing the hidden assumption that such a second product was required. The bounded biological resolution is the process itself; the Friction Signature is its measurable biophysical organization, and phenomenology is its organism-relative inside view. These are not three independent events connected by causal conversion, but three analytically distinguishable aspects of one biologically organized process, constrained by the Mapping Theorem and open to empirical testing.

9.6 Closing the Explanatory Gap

The Explanatory Gap persists when two distinct operations are conflated: the primary organism-relative inside view of a biological event and the later narrator-level recognition and ownership of that event. Once these are treated as a single unexplained "subjective experience," the delayed narrator is mistakenly positioned as the original experiencer to whom phenomenology must somehow be delivered.

The architecture developed in Sections 8 and 9 separates these operations. L1 accounts for organism-relative registration, integration, valuation, and bounded resolution, whose inside view is primary phenomenology. L2 accounts for the later recursive organization through which that event is remembered, compared, interpreted, attributed to "me," incorporated into autobiographical continuity, and prepared for report.

System Latency establishes that these operations cannot be temporally identical. Narrator-level recognition becomes available only after sufficient L1 processing has already occurred. [90, 91, 96, 104, 107, 136, 137] The narrator can therefore organize and claim the event, and can causally influence what follows, but it cannot be the original experiencer of the event it retrospectively represents as "my experience."

The gap is closed through two linked deconflations. First, the bounded biological resolution and phenomenology are not separate products connected by an unexplained conversion; phenomenology is the organism-relative inside view of that biologically organized process. Second, primary phenomenology and narrator-level ownership are not the same operation; the latter is a downstream recursive construction generated through memory and psychological time.

The Mapping Theorem constrains the biological organization to which this identity claim applies, while Friction Signatures provide measurable access to that organization. L1 accounts for the primary inside-view event, and L2 accounts for its recognition, ownership, interpretation, autobiographical organization, and report. Once these operations and their recurrent interaction are included, no additional observer, phenomenal product, or independent experiencer remains outside the account.

10.0 From Recursive Processing to the Apparent Subject

10.1 The Virtual Narrator: From Physical Process to Apparent Subject

The objective of this section is to derive how materially instantiated recursive processing generates and continually maintains the apparent thinker, owner, and observer ordinarily experienced as "me." The claim is not that self-related processing is unreal, immaterial, or causally inert. The biological processes through which memory, comparison, valuation, projection, attribution, and report occur are physically implemented and require real electrical, ionic, metabolic, temporal, and regulatory work. [33–35, 42, 68, 69, 90, 91, 96–102, 107] What is virtual is the independently existing subject that these processes appear to represent.

A distinction must therefore be maintained between organism-relative biological reference and the conditioned narrator. A living organism must register bodily state, environmental change, possible action, and consequences in relation to its own continued organization. [23, 24, 68, 131] This foundational self-reference is an evolutionarily necessary feature of adaptive biological control. The conditioned narrator develops when retained history, present evaluation, and anticipated future states are recursively organized around a temporally continuous reference expressed as "mine," "for me," and "happening to me."

Within the framework, this narrator does not exist prior to thought as the agent that authors, directs, or observes it. Thought operating as psychological time continually reactivates retained biological history, compares it with present conditions, projects

possible consequences, and organizes these changing states around a common organism-relative index. Through repeated recursive updating, that index acquires apparent continuity and is experienced as a stable inner subject. The self is therefore not the origin of the recursive audit; it is the virtual reference point generated and maintained by the audit's ongoing organization.

The physical implementation of this process and the apparent subject it represents are not identical. The implementing activity is distributed across real biological systems and can alter subsequent behaviour, physiology, attention, memory, and valuation. The unified owner, thinker, or observer implied by that activity is not an additional entity standing behind those systems. The implementation is physical; the represented referent is virtual.

System Latency provides a decisive physical constraint upon this distinction. Narrator-level recognition and ownership become available only after sufficient organism-relative registration and integration have already occurred. [90, 91, 96, 104, 107, 136, 137] The narrator can reconstruct the event, attribute it to "me," and influence later biological processing, but it cannot retrospectively become the original subject or recipient of the primary phenomenology required for its own representation to arise. Phenomenology is primary; possession is recursively constructed.

The argument developed in this section is therefore cumulative. Temporal downstreamness excludes the narrator from the position of original experiencer; recursive architecture explains how the apparent subject is generated; evolutionary analysis explains why an organism-relative reference is biologically useful; and empirical manipulations of ownership, agency, self-location, bodily boundaries, and narrative continuity demonstrate that the principal features attributed to a unitary self depend upon alterable biological processes. [5–7, 45–49, 69, 72, 140]

The resulting claim is precise: the narrator is a materially implemented recursive process with genuine causal consequences, while the independent thinker, controller, owner, and observer represented by that process has no additional physical instantiation. Section 10 will derive how this virtual reference point is generated, why it appears stable, why it is mistaken for an entity, and how that mistake produces the apparent subject to whom phenomenology is retrospectively assigned.

10.2 System Latency and the Temporal Exclusion Constraint

Section 8 established System Latency ($t\ s$) as the unavoidable non-zero interval between sufficient primary organism-relative integration and the earliest recursive availability of that event for narrator-level recognition, attribution, and report. The present subsection derives the consequence of that temporal ordering for the apparent subject of experience.

Let:

$$t\_L1$$

denote the reference time at which sufficient L1 registration, integration, valuation, and resolution have occurred for an event.

Let:

$$t\_L2$$

denote the earliest time at which that event becomes recursively available for L2 recognition, comparison, attribution, ownership, or report.

System Latency is therefore:

$$t\_s = t\_L2 - t\_L1$$

Because the physical processes required for recursive availability take non-zero time [90, 91, 103, 104, 136, 137]:

$$t\_s > 0$$

It follows that:

$$t\_L2 > t\_L1$$

This ordering imposes a Temporal Exclusion Constraint. A narrator-level representation that becomes available only at t_L2 cannot have occupied the position of original subject, recipient, owner, or antecedent author of the event whose sufficient biological resolution had already occurred at t_L1. The narrator can later remember, reconstruct, interpret, and claim that event, but it cannot retrospectively become the entity to whom the primary event was originally presented.

The empirical significance of System Latency is therefore not merely that recognition and report require time. By placing narrator-level ownership downstream from primary phenomenology, it physically excludes the narrator from being the original subject, recipient, or owner of the event it later reconstructs and claims as "my experience."

This exclusion does not make L2 causally inert. Recursive interpretation can generate internally evaluated stimuli that modify subsequent attention, autonomic state, perception, behaviour, and biological resolution. The recurrent architecture may be represented schematically as:

$$L1\_n \rightarrow L2\_n \rightarrow I\_n \rightarrow L1\_n + 1$$

where $I\ n$ denotes an internally generated stimulus arising from the recursive interpretation of event n. In this sequence, $L2\_n$ can causally influence the subsequent state $L1\ n + 1$. It cannot, however, reverse the physical order and become the antecedent cause or original recipient of $L1\_n$:

$$L2\_n \nrightarrow L1\_n$$

Recurrence therefore creates causal circularity across successive states without eliminating temporal order within any particular event. The narrator may reshape what happens next, but it cannot travel backward into the event that was required for its own representation to arise.

This distinction also clarifies what is ordinarily compressed into the expression "subjective experience." Primary phenomenology, later recognition, attributed ownership, autobiographical interpretation, and report are often treated as though they were one simultaneous occurrence:

$$\text{phenomenology} = \text{my recognized and owned experience}$$

The temporal architecture instead reveals an ordered relation:

$$\text{primary phenomenology} \rightarrow \text{recursive reconstruction} \rightarrow \text{attribution to "me"}$$

The experienced possession of the event is therefore a downstream representational achievement. Phenomenology is primary; possession is recursively constructed.

The narrator-level process may itself contribute to the later felt character of total consciousness. Memory, anticipation, judgment, resistance, and self-referential thought are materially implemented biological events with their own organism-relative consequences. What the Temporal Exclusion Constraint rules out is not all L2 phenomenology, but the claim that the virtual owner represented at L2 was already present as an independent witness or recipient of the earlier L1 event.

The explanatory gap is consequently malformed when it asks how biological activity produces phenomenology "for" this narrator. The narrator-level "me" did not occupy the required temporal position. It is the later organism-relative reference through which an already occurring event becomes remembered, attributed, organized, and reported as "my experience."

System Latency does not by itself complete the derivation of the narrator as a virtual variable. It does, however, provide the decisive physical exclusion: the narrator cannot be the primitive subject silently presupposed by the conventional formulation of subjective experience. The following subsections will show how recursive organism-relative processing generates that apparent subject and why its continuously maintained reference point is mistaken for an independently existing thinker, controller, and owner.

10.3 Material Implementation and the Virtual Referent

The narrator must be separated into two analytically distinct components: the biological process that generates and maintains self-reference, and the apparent owner to which that self-reference points. The first is materially instantiated. The second is virtual.

The implementing process consists of real biological activity distributed across memory, valuation, attention, interoception, language, prediction, action planning, and self-referential integration. [23, 68, 69, 96–102, 107] Axonal conduction, synaptic transmission, recurrent network activity, ion-channel dynamics, ATP-dependent membrane restoration, and autonomic regulation all contribute to this activity. [24, 33–35, 68, 90, 91, 103, 111] These processes occur in physical tissue, require energy, occupy time, and can alter subsequent physiology and behaviour.

The narrator is therefore not immaterial. Every act of remembering, comparing, judging, anticipating, attributing, or reporting depends upon a measurable biological implementation. System Latency itself confirms this material dependence: narrator-level organization cannot arise instantaneously because its construction requires finite propagation, integration, and recurrent processing. [90, 91, 103, 104, 107, 136, 137]

What is not independently instantiated is the unified thinker, observer, controller, or owner represented by that activity. The biological system generates statements and evaluations organized around "I," "me," and "mine," but the grammatical and phenomenological unity of that reference does not establish the existence of an additional entity standing behind the processes that generate it.

The distinction may be expressed as:

$$\text{physical recursive implementation} \neq \text{independent represented owner}$$

The left side consists of mass-energy-bearing biological processes. The right side is the apparent central referent produced when those distributed processes are recursively indexed around a common organism-relative coordinate. The referent does not possess additional mass, energy, location, or causal capacity beyond the processes through which it is represented.

This is the precise sense in which the self is a virtual variable. "Virtual" does not mean imaginary, ineffective, or biologically irrelevant. A virtual variable can organize real relations and support real control without being an additional material object. In physical analysis, a derived reference point may summarize the organization of a distributed system without constituting another component inside that system. Similarly, the narrator provides a common index through which memory, bodily state, anticipated consequence, and action are organized, while no separate observer is added to the biology.

The biological reference is also more than a passive label. Once a state is represented as "my threat," "my failure," "my intention," or "my future," that representation can modify attention, autonomic activity, memory retrieval, decision-making, and subsequent L1 registration. [12, 13, 21, 68, 69, 114–116] Its causal efficacy belongs to the materially instantiated recursive process, however, not to an independent owner acting through it.

The relevant causal sequence is therefore not:

$$\text{independent self} \rightarrow \text{biological thought and action}$$

It is:

$$\text{recursive biological processing} \rightarrow \text{self-referential representation} \rightarrow \text{subsequent biological change}$$

The self-representation participates in causation because it is physically implemented. The apparent self does not stand outside that sequence as its initiator. It is generated within the sequence as the reference around which organism-relative information is organized.

This distinction resolves the apparent contradiction between virtuality and biological effectiveness. The narrator can be metabolically costly, temporally extended, behaviourally influential, and neurologically alterable while the independent owner it represents remains physically absent. The process has material implementation; the represented subject has no additional physical instantiation.

The claim of zero additional physical remainder is therefore not that nothing occurs when a person thinks "I." A substantial biological process occurs. The claim is that once the distributed processes producing memory, comparison, ownership, projection, action selection, and report have been included, no further mass-bearing thinker or observer must be inserted to perform those functions.

The implementation is physical; the represented referent is virtual. This distinction provides the foundation for the next stage of the derivation: explaining why evolutionarily necessary organism-relative processing naturally generates a common reference coordinate and why that coordinate becomes experienced as an enduring self.

10.4 The Organism-Relative Index as Evolutionary Architectural Necessity

A living organism cannot regulate itself or act adaptively from a neutral standpoint. Changes in the environment and within the body are differentially registered and resolved relative to the organism's own condition, viability, needs, and possible actions. [23, 24, 131] A temperature change, approaching object, internal pain signal, food source, social cue, or remembered danger matters biologically through its relation to the living system undergoing it.

Organism-relative differential registration and regulation are therefore architectural requirements of adaptive control. The organism must continuously differentiate, among other relations, what is occurring within its body, what is occurring outside it, how changing conditions relate to its continued organization, and which actions remain available. These distinctions require biological reference frames centred upon the organism's present state and location.

This foundational organism-relative indexing should not be conflated with the conditioned narrator. Bodily regulation, self-location, interoception, proprioception, and action selection can occur without autobiographical reflection or a linguistic sense of "me." [1, 2, 23, 68, 72, 140] They provide the older biological architecture from which more elaborate self-reference can develop, but they do not by themselves constitute the temporally extended narrator.

As memory, prediction, social learning, and future-oriented planning become more complex, organism-relative evaluation must operate across increasingly extended intervals. [5–10, 68, 96–102, 134] Present conditions are compared with retained biological history, and possible actions are evaluated according to their anticipated consequences. The relevant relations expand from the immediate body and environment to include remembered injury, learned identity, social standing, responsibility, expected reward, and possible future condition.

The resulting organization may be represented schematically as:

present organismic state
\+
environmental conditions
\+
retained history
\+
possible future consequences
→
organism-relative evaluation

Because each of these changing states is evaluated in relation to the same living organism, they are repeatedly indexed around a common reference coordinate. Events become organized as affecting this body, continuing this history, threatening this future, or requiring action from this organism. At the recursive level, these relations become expressed as "mine," "for me," "about me," and "what may happen to me."

The architecture does not first create an independently existing self and then use it to evaluate the organism's condition. The direction is the reverse. Evolutionarily useful mechanisms for organism-relative regulation, memory, prediction, and action continually organize changing information around a common reference coordinate. The apparent self emerges from the continuity of that organization.

The framework therefore does not propose that evolution deliberately constructs an illusion. Selection acts upon biological functions that improve adaptive regulation: preserving bodily integrity, avoiding danger, acquiring resources, coordinating social behaviour, learning from prior outcomes, and preparing for future conditions. [24, 131–135] A continually updated organism-relative reference provides an efficient architecture through which these functions can be integrated across time.

The virtual narrator is an elaboration of this adaptive architecture. When organism-relative evaluation becomes recursively extended through retained memory and anticipated future states, the reference coordinate acquires autobiographical depth and apparent temporal continuity. The system no longer organizes only what is occurring here and now, but what happened to "me," what it means for "me," and what may happen to "me" next.

Identity continuity is not necessarily represented as a separate computational objective. It emerges because successive memories, evaluations, projections, and actions are repeatedly organized around the same organism-relative index. The reference point appears to persist because it is continuously regenerated across changing biological states.

This distinction is essential. The organism-relative architecture is biologically useful and, for complex adaptive behaviour, functionally necessary. The error does not lie in possessing such an architecture. It arises when the continually regenerated reference coordinate is mistaken for an independently existing thinker, controller, observer, or owner standing behind the biological processes that generate it.

The evolutionary sequence proposed by the framework is therefore not:

independent self
→
organism-relative evaluation

It is:

adaptive organism-relative regulation
→
recursive evaluation across memory and anticipation
→
continuously updated virtual reference point

The conditioned narrator is consequently neither an accidental fiction nor an ontologically independent subject. It is the virtual reference generated when evolutionarily useful organism-relative processing is recursively extended through psychological time. The next subsection examines the biological preconditions and operational sequence through which that recursive audit is engaged.

10.5 Preconditions and Operation of the Recursive Audit

The recursive audit does not arise from a pre-existing narrator deciding to examine experience. It is a materially implemented organism-relative process that becomes possible when several biological capacities are present and becomes engaged when present conditions require evaluation through retained history.

Three preconditions are central to the architecture. First, the organism must be capable of retaining biological representations of prior events. Second, it must be capable of reactivating and recombining those representations as thought. Third, it must possess organism-relative biological valuation through which present changes acquire differential significance for the organism's own condition, viability, and possible action, while anticipated changes enter evaluation only when retained representations are reactivated through thought.

These capacities should be distinguished from the active recursive audit itself. A retained memory trace may remain biologically encoded without presently entering thought. [96, 97] The capacity for comparison and projection may likewise remain available without being continuously recruited to the same degree. The recursive audit becomes actively engaged when an external event or internally generated state is evaluated through reactivated representations of the past.

The distinction may be expressed schematically as:

$$\text{capacity for recursive audit}$$

Engagement of that capacity occurs when present processing recruits retained history:

$$\begin{gathered}\text{present or internally generated stimulus}\\ \rightarrow\\ \text{reactivation of retained representations}\\ \rightarrow\\ \text{recursive organism-relative evaluation}\end{gathered}$$

The audit operates upon both externally initiated and internally generated stimuli. An unfamiliar sound, social interaction, bodily sensation, or perceived threat may initiate the sequence from the environment. A memory, imagined future, unresolved judgment, anticipated loss, or self-referential comparison may initiate it internally. Once active, internally generated content can modify the organism's present biological state and thereby become new material for further evaluation. [12, 13, 16, 21, 69, 114, 115]

Primary organism-relative valuation does not begin with the recursive audit. At L1, consequential change is already registered and valued through sensory, interoceptive, metabolic, autonomic, and regulatory processes before narrator-level interpretation becomes available. [23, 24, 33–35, 90, 91, 136, 137] Here, "valued" refers to organism-relative biological differentiation and does not imply conscious judgment, representational evaluation, or psychological time. L2 does not create the fact that an event matters to the organism. It recursively interprets what that significance means in relation to retained history, anticipated consequences, learned identity, and possible future action.

The operating sequence can therefore be represented as:

$$\begin{gathered}L1\ \textit{registration and valuation}\\ \rightarrow\\ \textit{L2 memory retrieval, comparison, and projection}\\ \rightarrow\\ \text{internally generated evaluation}\\ \rightarrow\\ \text{altered present biological state}\\ \rightarrow\\ \text{renewed L1 and L2 processing}\end{gathered}$$

Psychological time is the medium through which this recursion becomes temporally extended. While inactive, a memory trace remains part of the organism's retained biological history. When reactivated as thought, the past is introduced into present processing. Comparison then evaluates the present through what has previously occurred, while projection extends that comparison toward what may occur next. [9, 10, 96, 98, 114, 115]

The audit therefore does not evaluate present conditions from a neutral or organism-independent standpoint. Every reactivated representation has been encoded within the history of a particular organism, and every present evaluation occurs in relation to that organism's current condition, learned expectations, biological needs, and available actions. [24, 96, 131] The recursive audit is inherently organism-relative because no external observer or context-free computational position exists within the living system.

Several operations emerge through this recursive organization: memory retrieval, comparison, interpretation, expectation, judgment, behavioural updating, cognitive updating, and future projection. [68, 96–102, 107] These should not be understood as actions performed by an already existing self. They are distributed biological operations whose recurrent organization will generate and maintain the apparent self-reference examined in the following subsection.

The distinction between process and narrator is therefore fundamental:

$$\text{recursive audit} \neq \text{activity performed by an antecedent self}$$

Rather:

$$\begin{gathered}\text{recursive audit} \\ \rightarrow \\ \text{continuously updated self-referential organization}\end{gathered}$$

At this stage of the derivation, the recursive audit can be understood as an adaptive biological process that brings retained history into relation with present organismic conditions and anticipated consequences. Its operation is real, temporally extended, metabolically supported, and causally consequential. [12, 13, 33–35, 42, 68, 90, 91] The narrator is not yet required as an initiating entity. It will emerge as the virtual reference point continuously generated by this recursive organization.

10.6 Psychological Time and the Construction of Continuity

The recursive audit becomes temporally extended when retained biological history is reactivated within present processing. A stored trace does not, merely by remaining encoded, constitute active psychological time. Psychological time begins when prior experience is re-entered as thought and used to interpret the organism's present condition or anticipate what may occur next.

The distinction may be expressed as:

$$\text{inactive retained trace} \neq \text{active psychological time}$$

Whereas:

$$\begin{gathered}\text{reactivated history} + \text{present organism-relative evaluation} \\ \rightarrow \\ \text{psychological time}\end{gathered}$$

Through this operation, the past becomes biologically active in the present. A remembered injury may reorganize present threat valuation; a retained social judgment may alter current bodily regulation; a previous success may shape present expectation; and an unresolved conflict may be reconstructed as a possible future danger. [9, 10, 12, 13, 114, 115] The remembered event is not physically transported from the past. Its retained biological representation is reactivated and becomes part of the organism's current state.

Psychological time also extends present evaluation toward anticipated futures. The organism does not merely retrieve what has occurred. It recombines retained representations, present conditions, learned regularities, goals, and uncertainty into projections of what may occur. These projections can then influence present action and physiology despite referring to events that have not happened. [9, 10, 98, 114–116]

The temporal movement relevant to the narrator may therefore be represented as:

$$\begin{gathered}\text{retained past} \\ \rightarrow \\ \text{present reactivation and evaluation} \\ \rightarrow \\ \text{anticipated future} \\ \rightarrow \\ \text{updated present state}\end{gathered}$$

Past and future are not independent locations occupied by an enduring self. They are biologically generated organizations made active within the present. The apparent temporal continuity of "me" arises because remembered and anticipated states are repeatedly indexed relative to the same living organism.

A past event becomes represented as something that happened to "me." A present condition becomes represented as what is happening to "me." A projected event becomes represented as what may happen to "me." The content changes continuously, but the organism-relative index around which that content is organized is repeatedly regenerated.

Identity continuity therefore does not require an unchanging self-substance to pass intact from one moment to the next. Nor does it require the system to calculate a separate proposition stating that the self remains identical. Continuity emerges because successive memories, evaluations, expectations, and projections are recursively related to one another through a recurrent organism-relative reference.

This process should not be understood as the exact reproduction of an objective personal history. Retained representations may be incomplete, reconstructed, revised, or reorganized whenever they are reactivated. [5–7, 9, 10, 114] The narrator can therefore

appear continuous even while the autobiographical content through which that continuity is maintained changes over time. What persists is not an invariant archive or entity, but the repeated organization of changing content around the same apparent owner.

The continuity of the narrator is consequently dynamic rather than substantial:

continuous recursive updating

The apparent stability of "me" results from the frequency and coherence of this updating. Because organism-relative memory, interpretation, and projection recur throughout waking cognition, the reference point rarely appears to disappear and then be reconstructed. It is experienced instead as a continuously present subject accompanying thought from one event to the next.

The intuitive interpretation reverses the actual architecture. It appears that a persisting self remembers its past and imagines its future:

enduring self
→
memory and projection

Within the framework, the direction is instead:

memory reactivation and future projection
→
continuously renewed self-continuity

The apparent subject does not first exist and then travel through psychological time. Thought operating as psychological time continually reconstructs the temporal relations from which the apparent persistence of that subject emerges.

This does not imply that every occurrence of memory or anticipation generates an elaborate autobiographical narrator to the same degree. Recursive organization varies with task, arousal, significance, cognitive capacity, and biological state. [15, 22, 96, 97] The architectural claim is that when retained history and anticipated consequences are repeatedly organized as belonging to one temporally extended organism, they provide the conditions through which the conditioned narrator acquires continuity.

Psychological time is therefore not merely a timeline observed by the self. It is the active recursive movement through which retained past and anticipated future are brought into present organism-relative evaluation. By continually binding these changing temporal representations to "me," the audit constructs the appearance of an owner who persists across them.

The next subsection completes this reversal. Memory, comparison, interpretation, and projection are not activities initiated by an already existing narrator. Their recurrent organization generates and continually maintains the virtual reference point that is subsequently experienced as the thinker of thought and the subject moving through time.

10.7 The Recursive Generation of the Narrator

The preceding subsections established the biological operation of the recursive audit and the role of psychological time in maintaining apparent continuity. The present subsection completes the derivation by showing how those operations generate the narrator as a continuously updated virtual reference point.

The recursive audit repeatedly relates present organismic conditions to retained history and anticipated consequences. [9, 10, 96, 98] A current sensation, perception, memory, or thought is compared with what has previously occurred, evaluated according to its significance for the organism, and projected toward what may happen next. [9, 10, 68, 96–98] Because each evaluation concerns the condition, history, or possible future of the same living organism, changing content is repeatedly organized around a common reference.

The sequence may be represented schematically as:

present organism-relative state
→
reactivated history
→
comparison and valuation
→
anticipated consequence
→
updated organism-relative reference

The reference point does not need to be deliberately computed as a separate object. It emerges because the recursive evaluation must repeatedly distinguish what affects this organism, belongs to its history, constrains its action, threatens its future, or requires

its response. At the narrator level, these relations become organized through the recurrent forms “mine,” “for me,” “about me,” and “happening to me.”

The self is therefore not first created as an entity and then supplied with thoughts. Each recursive cycle contributes to a self-referential organization through which thought is interpreted as belonging to an apparent thinker. Because this indexing is repeatedly renewed, the reference appears continuous despite being dynamically regenerated.

The intuitive architecture is:

$$\begin{gathered}\text{independently existing thinker}\\ \rightarrow\\ \text{thought}\end{gathered}$$

The derived architecture is the reverse:

$$\begin{gathered}\text{thought operating as psychological time}\\ \rightarrow\\ \text{recursive organism-relative indexing}\\ \rightarrow\\ \text{continuously updated narrator}\end{gathered}$$

The narrator is consequently not the antecedent author of the process. Memory retrieval, comparison, valuation, expectation, judgment, and projection are not actions initiated by an already existing “me.” Their recurrent biological organization generates the reference point to which those same operations are subsequently attributed.

This reversal explains why the experience of authorship is so convincing. By the time a thought becomes recursively recognized, it has already been indexed within the organism’s continuing history and represented as “my thought.” The attribution appears inseparable from the thought because both are integrated within the same recursive sequence. The resulting report—“I thought this”—compresses the biological generation of thought and its later self-attribution into the appearance of a single act performed by a prior thinker.

System Latency constrains this appearance physically. Narrator-level recognition and ownership occur only after sufficient antecedent processing has taken place. [17–20, 90, 91, 136, 137] The narrator can therefore represent a thought as its own, but it cannot have existed in advance as the independent agent required to initiate the very processing from which its representation emerged.

The generation of the narrator may be represented more fully as:

$$\begin{gathered}L1\ organism-relative\ registration\\ \rightarrow\\ \text{reactivation of retained history}\\ \rightarrow\\ \text{recursive comparison and projection}\\ \rightarrow\\ \text{self-referential attribution}\\ \rightarrow\\ \text{updated virtual narrator}\end{gathered}$$

The updated narrator then becomes part of the biological conditions affecting the next cycle:

$$\begin{gathered}\text{updated narrator\_}n\\ \rightarrow\\ \text{internally generated stimulus} * n*\\ \rightarrow *\\ \text{altered organismic state} * n+1\\ \rightarrow\\ \text{renewed recursive audit}\end{gathered}$$

This recurrent feedback can make the narrator appear to be a persistent controller. Its judgments and projections genuinely influence what happens next because they are physically implemented biological representations. [12, 13, 21, 114–116] Their causal effects do not establish that an independent owner initiated them. They show that the recursive process can act through the self-model it generates.

The narrator should therefore be understood as a virtual variable rather than a fixed object or localized entity. Its content, emotional character, priorities, memories, and anticipated future can change substantially while the common organism-relative index remains continuously renewed. The apparent stability belongs to the organization of the reference, not to an invariant substance standing behind it.

This also explains why identity continuity emerges without being the explicit objective of the audit. Every recursive cycle updates the organism's relationship to past, present, and future while retaining the common relational form of "me." Continuity is the accumulated effect of this repeated indexing:

$$\begin{gathered}\text{recursive updating across time} \\ \rightarrow \\ \text{apparent persistence of the narrator}\end{gathered}$$

The architecture does not "want" or consciously decide to manufacture a self. The virtual reference point emerges as a structural consequence of evolutionarily useful organism-relative evaluation extended through memory, comparison, and anticipation. Because it is continually regenerated, it appears enduring. Because it appears enduring, it is mistaken for an independently existing entity. Because it is mistaken for an entity, thought is attributed to it as author, phenomenology is attributed to it as possession, and action is attributed to it as controller.

The derivation therefore reverses the ordinary assumption at its foundation. The conditioned narrator does not stand prior to thought and conduct the recursive audit. Thought operating as psychological time constitutes the recursive movement through which the narrator is generated, updated, and maintained. The process is biologically real; the apparent independent thinker produced by that process is the virtual referent.

10.8 Causal Efficacy Without an Independent Controller

Describing the narrator as a virtual reference point does not imply that self-referential thought is causally powerless. The distinction is between the causal efficacy of the materially implemented process and the supposed agency of an independently existing owner represented by that process.

A self-referential evaluation such as "I am in danger," "I have failed," or "I must act" is implemented through real biological activity. It alters patterns of attention, memory retrieval, autonomic regulation, motor preparation, prediction, and subsequent sensory integration. [12, 13, 21, 68, 69, 114–116] The representation can therefore change what the organism does and what it later experiences.

Its causal influence does not require a separate self to read the representation and issue a command. The physically implemented state directly modifies the biological conditions from which subsequent processing proceeds. The causal relation is contained within the organization of the system itself.

The architecture may be represented as:

$$\begin{gathered}\text{recursive evaluation}\_n \\ \rightarrow \\ \text{self-referential biological state} * n* \\ \rightarrow * \\ \text{altered organismic conditions} * n+1\end{gathered}$$

The self-referential state is causally effective because it is instantiated through neural, metabolic, autonomic, and regulatory processes. What does not possess an additional causal role is the virtual owner apparently referred to by "I."

This distinction prevents a homuncular interpretation of the audit. No internal observer receives a completed thought, decides what it means, and then instructs the organism how to respond. Meaning, valuation, ownership, and behavioural preparation are realized through the same distributed biological operations that generate the self-referential representation.

For example, a remembered social threat may be recursively interpreted as "this may happen to me again." That evaluation can increase vigilance, alter breathing and cardiovascular regulation, recruit related memories, bias ambiguous perception, and prepare avoidance. [11–14, 21, 56, 57, 114, 115] These changes then become new organism-relative conditions available to L1 and L2:

$$\begin{gathered}\text{remembered threat}\\ \rightarrow\\ \text{self-referential projection}\\ \rightarrow\\ \text{altered physiology and attention}\\ \rightarrow\\ \text{renewed registration and audit}\end{gathered}$$

The resulting loop may appear to be directed by a persistent controller because each cycle is organized around the continuing reference "me." Yet the apparent controller is itself updated by the same process. Its judgments, intentions, and fears are not commands originating outside the loop; they are biologically realized states within it.

Agency is therefore not denied at the level of organismic causation. The organism can evaluate alternatives, inhibit responses, form intentions, pursue goals, and modify future behaviour. [68, 72, 116] What is rejected is the addition of a separate inner agent standing behind those operations and independently initiating them.

The distinction can be expressed as:

$$\text{organismic control} \neq \text{independent internal controller}$$

Organismic control consists of distributed causal regulation across perception, memory, valuation, prediction, inhibition, and action. The independent controller is the virtual referent produced when these operations are retrospectively unified and attributed to a single enduring author.

This also explains why the narrator appears to possess free causal command. Once an outcome follows a self-referential intention, the recursive audit links the intention, action, and result into an autobiographical sequence: "I decided, I acted, and I caused the outcome." That organization may accurately summarize aspects of the organism's causal history, but it does not demonstrate that an additional self existed prior to the implementing processes as their source.

System Latency again constrains the interpretation. Narrator-level ownership of an intention may become available only after antecedent biological preparation has begun. [17–20] The later representation can participate in further inhibition, revision, or action, but it cannot be projected backward as the independent origin of every process that preceded its formation.

Causal feedback therefore occurs without reversing the derivation established in the preceding subsection. Thought generates and updates the narrator, while the resulting self-referential organization becomes part of the biological conditions shaping later thought and action:

$$\begin{gathered}\text{recursive thought\_}n\\ \rightarrow\\ \text{updated narrator} * n*\\ \rightarrow *\\ \text{subsequent recursive thought} * n+1\end{gathered}$$

This relation is circular across successive states but does not require a controller outside the circle. Each state arises from prior biological conditions and contributes to those that follow.

The virtual narrator is consequently neither an inert fiction nor an autonomous pilot. It is a causally consequential reference structure instantiated within the organism's recursive biology. Its efficacy belongs to the material organization that generates it; its apparent independent authorship results from attributing that organization to the unified owner it represents.

The architectural conclusion is precise: the organism acts through physically implemented self-referential processes, but no additional thinker, controller, or owner must be inserted to make those processes causal. The process influences the future; the virtual referent does not stand apart from the process and command it.

10.9 Empirical Convergence: Manipulating the Components of Selfhood

The virtual-variable account does not depend upon a single experiment showing that "the self" is unreal. Its empirical strength lies in convergence. The properties ordinarily attributed to one indivisible inner subject—bodily ownership, self-location, agency, authorship, temporal continuity, and narrative identity—can be experimentally manipulated or clinically dissociated by altering the biological processes through which those properties are generated. [20, 45, 72, 140–149]

This evidence should not be interpreted as showing that self-related processing is arbitrary or biologically unimportant. The framework predicts the opposite. Organism-relative reference is deeply embedded in perception, regulation, memory, and action. The relevant result is that the experienced unity of the self depends upon the ongoing integration of multiple alterable processes rather than upon an independently existing owner standing behind them.

Body Ownership as a Generated Assignment

The Rubber Hand Illusion demonstrates that bodily ownership depends upon the integration of vision, touch, and proprioception. [141] When a visible artificial hand and the participant's hidden biological hand are touched in a sufficiently synchronous and anatomically plausible manner, tactile sensation may become referred toward the artificial hand and the artificial hand may be experienced as belonging to the participant. [141]

The biological hand remains connected to the organism, while the artificial hand has no shared biological history with it. Nevertheless, the experienced assignment of "mine" can shift toward the artificial object when the relevant multisensory relations are reorganized. The experiment does not show that all bodily selfhood is arbitrary. It shows that ownership is an actively generated relational assignment rather than a fixed property directly supplied by the physical limb.

Somatoparaphrenia provides the complementary clinical dissociation. Following particular forms of brain injury, a person may deny that their own limb belongs to them or attribute it to another person. [142, 143] The biological limb remains physically connected to the same organism, yet the experienced ownership relation is weakened, altered, or absent. In some cases, changing visual perspective or attentional organization can partially restore recognition of the limb as one's own. [143]

Taken together, these cases constrain ownership from opposite directions:

$$\text{nonbiological limb} \rightarrow \text{ownership may be assigned}$$

$$\text{biological limb} \rightarrow \text{ownership may be withdrawn}$$

The physical identity of the limb is therefore insufficient by itself to determine experienced ownership. "Mine" is generated through biological integration and can change when that integration changes.

Self-Location and Bodily Boundaries as Constructed Coordinates

Full-body virtual-reality experiments extend this result beyond one limb. When participants view a representation of a body while correlated touch is applied to their unseen physical body, bodily self-identification and experienced self-location can shift toward the visually presented body. [140, 144] Later experiments have further shown that ownership and self-location, although normally coupled, can be selectively altered rather than operating as one indivisible faculty. [140, 144]

These findings are directly relevant to the virtual-reference-point account. The apparent location of "where I am" is not simply read from the position of an ontological observer permanently situated within the body. It is generated through the integration of visual, tactile, proprioceptive, vestibular, and spatial information.

Focal electrical stimulation provides causal neurological reinforcement. Stimulation near the temporoparietal region has induced apparent displacement from the body, altered perspective, and illusory transformations of body parts. [145] The person does not physically leave the body. The biological manipulation changes the system's representation of self-location and bodily configuration.

Floatation-REST supplies a different form of evidence. When external stimulation and the ordinary sensory contrasts defining the body are substantially reduced in thermoneutral salt water, participants report weaker bodily boundaries and altered subjective time. [146] The physical body remains intact, but the experienced distinction between body and environment becomes less definite.

These results indicate that bodily boundedness and self-location must be continuously stabilized through biological processing. They are not properties possessed by an independently located witness. They are dimensions of the organism-relative model through which the system organizes its body and environment.

The Self-Reference as a Processing Index

Self-prioritization experiments are especially relevant to the concept of a virtual variable. Participants can be taught arbitrary associations between simple geometric shapes and the labels "self," "friend," or "stranger." Shapes newly associated with "self" are subsequently identified more rapidly and, under relevant task conditions, with greater perceptual sensitivity than comparable shapes associated with others. [147]

The geometric shape does not contain an intrinsic self-property. Its processing is altered because the experimental association assigns it to the self-reference category. Once indexed as self-relevant, otherwise neutral information is granted processing priority.

This does not demonstrate that the entire self is arbitrary or that every self-related advantage is automatic. It demonstrates that "self" can function as an assignable biological index that reorganizes attention and perceptual selection. The index is operationally effective without requiring the existence of an additional owner who receives the prioritized information.

Within the framework, this is precisely the role of the virtual reference point. Information organized as "mine," "for me," or "about me" is processed differently because of the biological consequences attached to that relation. The reference performs real organizational work while the independently existing owner apparently designated by it remains unnecessary.

Agency and Authorship as Reconstructed Relations

The experienced authorship of action can also be manipulated. Under controlled conditions, participants can come to believe that they intentionally caused a movement that was externally produced when an action-consistent thought occurs at the appropriate

time. [20] The sense of authorship therefore depends partly upon the system's interpretation of the temporal and semantic relation between thought and outcome.

Direct cortical stimulation produces an even sharper dissociation. Stimulation of inferior parietal regions has induced the desire or intention to move and, at greater intensity, the belief that movement occurred despite the absence of corresponding muscular activity. Stimulation of premotor regions has produced actual movement that participants denied making. [148] Intention, movement, and awareness of movement can therefore be separated experimentally.

These findings do not establish that organisms lack agency or that all decisions are illusory. They invalidate the simple model of a unified inner controller transparently observing its own commands:

$$\text{independent controller} \rightarrow \text{intention} \rightarrow \text{movement} \rightarrow \text{awareness}$$

The empirical architecture is more distributed. Intention, motor preparation, action, prediction, sensory feedback, and attributed authorship depend upon partially distinguishable biological operations. Their successful integration produces the ordinarily seamless experience: "I intended, I acted, and I caused the result."

The experience of authorship is therefore a biologically generated organization of causal information. It may accurately summarize organism-level causation without demonstrating that an additional thinker or controller existed prior to the processes being summarized.

Thought and Meta-Awareness

The relationship between spontaneous thought and awareness of thought further constrains the narrator's presumed authorship. During focused-attention meditation, experimentally identified cognitive cycles distinguish periods of mind wandering from the later awareness that mind wandering has occurred, followed by attentional shifting and renewed focus. [149]

Thought is therefore already underway before the participant becomes recursively aware of it as thought. This does not prove that every thought precedes all forms of awareness, but it demonstrates that narrator-level recognition need not occupy the initiating position.

The sequence is compatible with the recursive architecture:

$$\text{spontaneous thought} \rightarrow \text{awareness of thought} \rightarrow \text{attribution and regulation}$$

The narrator can recognize the thought, classify it as "my mind wandering," and redirect subsequent processing. It need not have existed as an independent author who first created the thought and then observed its result.

Narrative Selfhood and Preserved Phenomenology

Psychedelic ego dissolution provides evidence at the level of temporally extended narrative selfhood. Under serotonergic psychedelics, participants may report marked weakening of ordinary self-boundaries, autobiographical authorship, and the distinction between self and world while remaining conscious and undergoing vivid phenomenology. These changes correlate with altered organization and connectivity in large-scale networks involved in self-referential processing, including the default-mode system. [45]

This does not locate the self in one network or show that all L2 activity has disappeared. It demonstrates that the coherence of the ordinary narrator depends upon modifiable biological organization and can be substantially weakened without eliminating phenomenology itself.

The result supports the distinction between:

$$\text{presence of phenomenology}$$

and:

$$\text{maintenance of a coherent autobiographical owner}$$

The self is therefore not a prerequisite for every phenomenal event in the form of an independently existing recipient. It is a particular recursive organization through which phenomenology becomes bounded, remembered, attributed, and narrated as belonging to a temporally extended "me."

The Convergent Result

No individual experiment establishes the complete virtual-variable derivation. The empirical force comes from the pattern across interventions and dissociations:

Bodily ownership can be assigned to an artificial limb and withdrawn from a biological limb. Self-location can be shifted away from the physical body. Body boundaries can weaken when the sensory information maintaining them is reduced. Arbitrary information associated with the self-reference can acquire processing priority. Intention, movement, and experienced authorship can be experimentally separated. Thought can occur before narrator-level recognition of that thought. Narrative selfhood can weaken while phenomenology remains. [20, 45, 140–149]

These findings reveal that the apparent self is not one empirically indivisible faculty. Its principal features depend upon distinguishable but interacting processes that can be reassigned, displaced, weakened, or dissociated by altering their biological implementation.

The evidence does not show that nothing physically real corresponds to self-related cognition. Considerable biological activity is required to maintain ownership, location, agency, memory, prediction, and autobiographical organization. What the findings fail to require is an additional owner standing behind those operations.

The empirical convergence is therefore consistent with the cumulative derivation developed in this section:

$$\begin{gathered}\text{alterable biological processes}\\ \rightarrow\\ \text{integrated organism-relative self-reference}\\ \rightarrow\\ \text{appearance of a unitary owner}\end{gathered}$$

System Latency establishes that this apparent owner is temporally downstream. The recursive derivation explains how it is continually generated. The dissociation evidence shows that its component properties depend upon alterable biological organization. Once those processes are included, no additional thinker, observer, or recipient is required to account for the functions attributed to the narrator.

The empirical result is not that the self-process is nonexistent. It is that the process is distributed, constructed, temporally extended, and biologically maintained, while the independently existing owner it represents has no additional physical instantiation. The process is real; the apparent entity is virtual.

10.10 The Reference-Point Category Error

The organism-relative reference generated by the recursive audit performs a legitimate biological function. It coordinates bodily condition, retained history, anticipated consequence, social relevance, and possible action around a common index. The category error begins when this functional reference point is reified as an independently existing subject standing behind the processes it organizes.

The error does not arise because the organism uses the relations "mine," "for me," or "about me." Those relations are biologically useful. The error arises when the continuously updated reference through which those relations are organized is mistaken for a separate thinker, observer, controller, witness, or owner.

The recursive sequence can be represented as:

$$\begin{gathered}\text{organism-relative processing}\\ \rightarrow\\ \text{continuously updated reference point}\\ \rightarrow\\ \text{attribution to "me"}\end{gathered}$$

Through repeated attribution, the reference point acquires apparent continuity. Because it appears continuous, it is treated as an entity. Because it is treated as an entity, biological operations occurring throughout the organism are retrospectively assigned to it:

thought occurs

→

thought is recognized as "my thought"

→

"I" am represented as its author

The same reversal occurs with phenomenology:

primary organism-relative phenomenology

→

recursive recognition and attribution

→

"I" am represented as its experiencer

The final representation compresses the preceding biological sequence into the apparent simplicity of "I experienced it." The grammatical subject of the report is then mistaken for the original biological subject of the event.

System Latency exposes the physical impossibility of this backward projection. Let t_L1 denote the time at which sufficient primary organism-relative integration and resolution have occurred for the event under analysis, and let t_L2 denote the earliest time at which that event becomes recursively available for L2 recognition, comparison, attribution, ownership, or report. Because the physical processes required for recursive availability take non-zero time [90, 91, 103, 104, 136, 137]:

$$t\_s = t\_L2 - t\_L1 > 0$$

Therefore:

$$t\_L2 > t\_L1$$

The narrator-level representation cannot be the antecedent cause, original subject, witness, recipient, or owner of the primary phenomenal event whose prior occurrence was required for that representation to arise. It may later remember, reconstruct, interpret, and claim the event, but it cannot retrospectively occupy the earlier position of the independently existing subject to whom the event was supposedly presented.

The empirical significance of System Latency is therefore not merely that recognition and report require time. By placing narrator-level ownership downstream from primary phenomenology, it physically excludes the narrator from being the original subject, recipient, or owner of the event it later reconstructs and claims as "my experience."

This empirically establishes the temporal constraint underlying the category-error diagnosis: narrator-level ownership is physically downstream from the event it later reconstructs and claims. The conventional subject–experience formulation treats narrator-level possession as though it were an original relation between phenomenology and a pre-existing subject. System Latency demonstrates that no such relation could have existed at the relevant temporal position. The event occurred organism-relatively before the narrator-level owner became available; the later representation "I experienced it" is therefore an act of recursive attribution, not evidence that an independently existing "I" originally received the event.

Recurrence does not remove this exclusion. A narrator-level state may generate internal stimuli and causally alter subsequent biological processing:

$$L1\_n \rightarrow L2\_n \rightarrow I\_n \rightarrow L1\_n + 1$$

However:

$$L2\_n \nrightarrow L1\_n$$

The later narrator may influence the next cycle, but it cannot travel backward and become the cause, witness, recipient, or owner of the event from which it arose. Recurrence creates causal continuity across successive states without erasing temporal order within the event being claimed.

A virtual reference point cannot literally receive or possess phenomenology. Ownership is an operation performed by the physical recursive architecture, not a relation between experience and an independently existing inner owner.

phenomenology is primary

possession is constructed

This distinction does not imply that phenomenology is impersonal in the sense of belonging to no organism. L1 phenomenology is intrinsically organism-relative because it is the inside view of a living system registering, valuing, integrating, and resolving consequential state-change. What is rejected is the additional claim that this organism-relative event must also be delivered to a separate narrator in order to become subjective.

The conventional formulation of subjective experience frequently conflates two meanings of "subject." The first refers to the living organism whose biological organization constitutes the inside-view event. The second refers to the narrator-level "me" that later recognizes, owns, interprets, and reports that event. Once the two are treated as identical, the downstream narrator is silently inserted into the primary event as though it had been present from the beginning.

The explanatory question is then malformed:

$$\text{How does biological activity produce experience for me?}$$

The "me" presupposed by the question is the very downstream construction whose generation must first be explained. Biology is asked to deliver phenomenology to an owner who was not independently present at the relevant temporal or causal position.

The category error therefore consists of projecting a functional reference variable backward and treating it as the ontological subject of the process from which it emerged. A coordinate used to organize organism-relative information is mistaken for an observer located at that coordinate. Attribution is mistaken for possession, continuity for substance, and retrospective authorship for antecedent control.

Language can reinforce this compression. Expressions such as "I thought," "I decided," and "I experienced" provide efficient summaries of organism-level events, but their grammatical form places a unified subject before the activity attributed to it. The biological architecture need not follow that grammatical order. The apparent subject named by "I" may instead be the recursively generated result of the processes that the sentence represents it as initiating.

This does not make ordinary self-reference useless or false in every practical sense. "I" remains an effective index for communication, planning, memory, responsibility, and social coordination. The error lies not in using the index, but in assigning it an independent ontological status and then treating it as the original receiver, witness, and controller of biological events.

The reference-point category error can therefore be summarized as:

$$\begin{gathered}\text{functional organism-relative index} \\ \neq \\ \text{independently existing observer}\end{gathered}$$

The recursive audit generates the index, continuously updates it, and attributes thought, action, and phenomenology to it. System Latency shows that this attributed owner is temporally downstream; empirical dissociations show that its component properties are biologically alterable [20, 45, 72, 140–149]; and the recursive derivation explains why the reference nevertheless appears stable and unitary.

The apparent self is not discovered as an entity already present within experience. It is generated as the reference through which experience is later organized and claimed. Once that distinction is made explicit, the narrator can no longer be treated as the primitive subject silently presupposed by the explanatory gap.

10.11 Structural Result: Physical Process, Virtual Owner

The preceding analysis establishes the narrator not as an independently existing subject, but as a materially implemented virtual reference point generated and continually maintained through recursive organism-relative processing. This conclusion does not depend upon one experiment or one philosophical assumption. It follows cumulatively from the temporal, biological, evolutionary, recursive, and empirical constraints developed throughout this section.

The recursive process is physically real. Memory reactivation, comparison, valuation, projection, attribution, self-referential organization, and report require finite neural transmission, recurrent network activity, ionic regulation, metabolic support, and ongoing biological maintenance. [33–35, 42, 68, 69, 90, 91, 96–103, 107, 136, 137] These operations occupy time, consume energy, and causally alter subsequent physiology and behaviour.

The unified thinker, controller, observer, or owner represented by those operations is not an additional physical component. Once the biological processes implementing self-reference have been included, no further mass-bearing entity remains to perform the functions attributed to "me." The implementation is physical; the represented referent is virtual.

System Latency supplies the decisive temporal constraint. Narrator-level recognition and ownership become available only after sufficient primary organism-relative integration has already occurred [90, 91, 103, 104, 136, 137]:

$$t\_s = t\_L2 - t\_L1 > 0$$

Therefore:

$$t\_L2 > t\_L1$$

The empirically constrained temporal ordering established by System Latency excludes the narrator, within the present architecture, from occupying the position of original subject silently assigned to it by the conventional subject–experience formulation of the Hard Problem. The supposed possession of phenomenology by that narrator is therefore a retrospective construction, not an original physical relation.

The narrator-level representation cannot be the antecedent author, original witness, recipient, or owner of the primary phenomenal event whose prior occurrence was required for that representation to arise. It may remember, reconstruct, interpret, and claim that event, but it cannot retrospectively become the independently existing subject to whom the event was supposedly presented.

Recurrence does not reverse this result. Narrator-level interpretation can generate internal stimuli and modify subsequent biological processing:

$$L1\_n \rightarrow L2\_n \rightarrow I\_n \rightarrow L1\_n + 1$$

However:

$$L2\_n \nrightarrow L1\_n$$

The narrator can influence what occurs next, but it cannot travel backward and possess, witness, or author the event from which it arose. Recursive circularity operates across successive states while preserving temporal order within the event under analysis.

The recursive derivation explains how the apparent subject nevertheless arises. Retained biological history is reactivated in the present, compared with current organismic conditions, evaluated according to organism-relative significance, and projected toward anticipated consequences. Because these changing states repeatedly concern the same living organism, they become organized around a common reference expressed as “mine,” “for me,” and “about me.”

The resulting reference is continually updated through psychological time:

$$\begin{gathered}\text{retained history} \\ \rightarrow \\ \text{present evaluation} \\ \rightarrow \\ \text{anticipated consequence} \\ \rightarrow \\ \text{updated organism-relative reference}\end{gathered}$$

The narrator does not stand prior to this process and conduct it. The recursive organization itself generates and maintains the narrator:

$$\begin{gathered}\text{thought operating as psychological time} \\ \rightarrow \\ \text{recursive organism-relative indexing} \\ \rightarrow \\ \text{continuously updated virtual narrator}\end{gathered}$$

Because the reference point is continually regenerated, it appears stable. Because it appears stable, continuity is interpreted as substance. Biological operations are then attributed to the apparent entity as its thoughts, decisions, actions, and experiences. The process that creates the narrator is thereby represented as though it were being controlled by the narrator it creates.

Evolutionary analysis explains why this reference architecture exists. A living organism must differentially register and regulate bodily state and environmental change relative to its own continued organization; in organisms capable of memory-dependent cognition, retained history, social consequence, and possible action can additionally be evaluated through thought. [23, 24, 68, 96–102, 131–135] Organism-relative indexing is therefore biologically useful and, for complex adaptive behaviour, architecturally necessary. The adaptive function lies in the reference architecture itself; it does not require the additional belief that the generated reference is an independently existing subject.

Empirical convergence supports this process account. Bodily ownership can be assigned to an artificial limb and withdrawn from a biological limb. Self-location and body boundaries can be displaced or weakened. Neutral information assigned to the self-reference can acquire processing priority. Intention, movement, and experienced authorship can be dissociated. Thought can precede narrator-level awareness of thought. Narrative selfhood can weaken while vivid phenomenology remains. [20, 45, 72, 140–149]

These findings do not demonstrate that self-related processing is unreal. They demonstrate that the properties ordinarily attributed to a single indivisible owner depend upon multiple alterable biological processes. The self-reference is functionally effective precisely because it is materially implemented; what remains unsupported is the existence of an additional observer standing behind that implementation.

The cumulative argument can therefore be expressed as:

$$\text{finite physical implementation}$$

$$+ \text{ temporal downstreamness}$$

$$+ \text{ recursive generation of an organism-relative reference}$$

$$+ \text{ evolutionary architectural necessity}$$

$$+ \text{ manipulability and dissociation of ownership, agency, and self-location}$$

$$+ \text{ absence of an additional independent controller}$$

$$\rightarrow \text{ physically implemented virtual self-reference}$$

A virtual reference point cannot literally receive or possess phenomenology. Ownership is an operation performed by the physical recursive architecture, not a relation between experience and an independently existing inner owner.

$$\text{phenomenology is primary}$$

$$\text{possession is constructed}$$

This result does not remove the living organism from the account. Phenomenology remains organism-relative, and the recursive narrator remains part of total consciousness as a biologically real, causally consequential process. What is removed is the additional inner subject supposedly standing apart from the process as its witness, owner, and controller.

Section 10 therefore completes the self-side of structural closure. System Latency physically excludes the narrator from the position of original experiencer; the recursive audit derives how that narrator is generated; evolutionary architecture explains its functional necessity; and empirical dissociations demonstrate the alterability of its component properties. Once these processes are accounted for, no independent thinker, observer, recipient, or owner remains outside the biological architecture.

The narrator is not an immaterial nothing. It is a materially implemented recursive process. What is virtual is the independent thinker, controller, witness, and owner that this process continuously represents.

11.0 Clinical and Neurological Stress Tests of the Architecture

The following clinical and neurological dissociations serve as convergent stress tests of the framework. Each case examines whether the distinctions among L1 primary integration, L2 recursive self-audit, self-referential continuity, report, and behavioral output remain coherent when these functions separate under altered biological conditions.

11.1 Phantom Limb Pain

Following amputation, the physical limb and its normal stream of distal sensory input are absent, yet the missing limb may continue to be experienced as having location, posture, movement, touch, or pain. Empirical evidence indicates that this phenomenon cannot be assigned to a single mechanism. Residual peripheral activity can contribute to phantom sensations and pain, while thalamic and cortical representations of the missing limb may remain functional long after amputation. Detailed representations of the missing hand can persist within sensorimotor cortex even decades after the limb itself has been lost. [150–153]

Within the framework, the decisive dissociation is between the physical presence of the limb and the organism's current biological resolution of limb-related activity. L1 does not passively reproduce the external body. It integrates the activity available within the organism through an already established body representation. When residual afferent activity, thalamic processing, or maintained sensorimotor dynamics are resolved through that representation, the resulting state can be experienced as occurring within a limb that is no longer physically present.

The persistence of the phantom representation and the painful quality of the phantom are related but distinct. The missing limb may be experienced without pain. [150, 153] Phantom limb pain arises when limb-related activity is integrated with pain-related and affective processes. L2 may then recognize the pain as occurring to "me," monitor it, remember previous episodes, anticipate

its recurrence, resist it, or assign it further personal significance. These recursive responses can increase the psychological burden of the pain without being required to generate the initial phantom percept.

Phantom limb pain therefore demonstrates a clear dissociation between external anatomy and phenomenological content. [150–153] The physical limb is absent, yet an organism-relative biological state continues to be resolved as the presence and, in painful cases, the suffering of that limb. The case aligns with the framework because the phantom is generated within the organism's integrational architecture rather than received from a currently existing limb or presented to a separate experiencer outside the process.

11.2 Blindsight

Following damage to the primary visual cortex, some patients retain a limited ability to localize, discriminate, orient toward, or respond to stimuli presented within clinically blind regions of the visual field, despite lacking ordinary visual awareness of those stimuli. This residual capacity is supported by visual pathways that can convey information to extrastriate regions without the normal route through V1. The preserved performance is task- and stimulus-dependent and should not be mistaken for intact vision. [154, 155]

Blindsight is not a single uniform condition. In type 1 blindsight, patients perform above chance while denying any acknowledged awareness of the stimulus. In type 2 blindsight, residual processing may be accompanied by a vague feeling that something occurred or by an abnormal and degraded form of visual awareness. The condition therefore reveals a graded dissociation between visual information capable of influencing behavior and the integrated visual state ordinarily experienced and reported as seeing. [156]

Within the framework, residual pathways preserve biologically effective visual registration, but damage to V1 disrupts the broader integrational dynamics through which that activity would normally be resolved as a stable L1 visual state. The residual signal may still guide orientation, attention, or forced-choice discrimination without generating ordinary visual phenomenology. Where partial integration remains, a minimal or degraded phenomenal state may occur, corresponding to type 2 blindsight.

The L2 narrator is not globally abolished. Patients can understand the task, compare alternatives, make decisions, and report that they did not see the stimulus. What is absent or degraded is the normally resolved visual state that L2 would recognize and describe. In type 1 blindsight, L2 therefore reports no acknowledged visual experience despite behaviorally effective residual processing; in type 2 blindsight, it may report only a vague or abnormal awareness. [155, 156]

Blindsight thus demonstrates that visual processing, visually guided behavior, phenomenological resolution, and report are separable functions. Information can influence behavior without becoming ordinary visual experience, while the narrator remains capable of reporting the absence or degraded character of that experience. [154–156] The case aligns cleanly with the framework's distinction between biological information processing, L1 phenomenological integration, and downstream L2 recognition and report.

11.3 Tinnitus

Subjective tinnitus is the perception of sound without a corresponding external acoustic source. It commonly occurs alongside hearing loss or other disruption of peripheral auditory input, but neither the initiating injury nor the resulting central changes are uniform across patients. Reduced inhibition, altered spontaneous activity, abnormal neural synchrony, gain changes, and plastic reorganization have all been identified within auditory pathways, while attention, salience, memory, and affective networks may also contribute to the persistence and personal impact of the condition. [157, 158]

Neuroimaging and electrophysiological studies support altered activity within auditory cortex, brainstem, thalamic, and distributed cortical networks, but they do not identify one universal tinnitus signature. Auditory-cortical hyperactivity is present in some studies but not others, particularly after differences in hearing loss, hyperacusis, stimulus conditions, and attention are considered. Tinnitus should therefore be understood as a heterogeneous internally generated auditory state rather than the product of a single established neural abnormality. [157, 158]

Within the framework, the decisive dissociation is between the presence of an external acoustic source and the organism's biological resolution of auditory activity. L1 does not simply reproduce sounds arriving from the environment. It integrates the activity currently available within the auditory system. When altered peripheral, brainstem, thalamic, cortical, or distributed network activity is resolved through that system as an auditory state, sound can be phenomenologically present even though no corresponding sound exists outside the organism.

The occurrence of the phantom percept must also be distinguished from the distress associated with it. Tinnitus loudness and tinnitus-related suffering are only partly coupled. Some individuals experience persistent tinnitus with limited distress, while others experience intense intrusion, anxiety, sleep disruption, or loss of concentration. Auditory–limbic, salience, attentional, and autonomic interactions contribute to this variation. [158, 159]

L2 may recognize and label the sound, monitor its persistence, compare its intensity across time, anticipate its recurrence, interpret it as threatening, and organize it as "my tinnitus." These recursive operations can increase its attentional prominence and psychological burden without being necessary to generate the initial auditory percept. Conversely, habituation can reduce distress and self-referential involvement even when the tinnitus remains phenomenologically present. [159]

Tinnitus therefore demonstrates two related dissociations. Auditory phenomenology can occur without a matching external acoustic source, and the resulting percept can persist independently of the degree of personal distress assigned to it. [157–159] The case aligns with the framework by separating L1 organism-relative auditory integration from the downstream affective, attentional, and recursive processes through which that percept becomes intrusive and personally consequential.

11.4 Locked-in Syndrome

In classical locked-in syndrome, damage to the ventral pons interrupts corticospinal and corticobulbar pathways, producing quadriplegia and loss of speech while consciousness remains preserved. Vertical eye movements and blinking are often spared, allowing patients to communicate through eye-coded responses. Neuropsychological studies indicate that language, memory, attention, intelligence, and coherent self-report can remain substantially preserved when the injury is largely restricted to the brainstem, although cognitive impairments may occur during the acute stage or when damage extends into additional cerebral or thalamic regions. [73]

Within the framework, the lesion primarily disconnects motor expression rather than dismantling the integrational architecture supporting phenomenology and recursive self-reference. When ascending arousal systems, sensory pathways, thalamocortical integration, and higher-order cortical networks remain sufficiently intact, L1 primary integration and L2 recognition and self-audit can continue even though voluntary motor commands cannot reach the speech musculature or limbs. The patient may therefore perceive, think, remember, evaluate, and maintain a coherent self-model while being unable to express these states through ordinary speech or movement.

Communication through eye movements and brain–computer interfaces demonstrates that organized cognition and reportable phenomenology can persist behind profound motor paralysis. Resting-state imaging likewise shows preservation of higher-order cortical networks relative to unresponsive states, although individual electrophysiological and metabolic measures may remain altered and should not be described as universally normal. In complete locked-in syndrome, where no reliable voluntary motor channel remains, the difficulty lies in detecting consciousness rather than in assuming its absence from the lack of behavior. [160, 161]

11.6 Psychedelic Ego Dissolution

Classic serotonergic psychedelics such as psilocybin and LSD can produce ego dissolution: a temporary weakening of the ordinary sense of being a bounded, continuous "I." Depending on the individual, dose, and context, this may involve diminished self–world boundaries, altered body ownership, reduced autobiographical continuity, or loss of the usual feeling that experience is being authored and possessed by a central self. These effects are graded rather than uniform and range from a mild loosening of self-reference to a profound disruption of ordinary selfhood. [45, 166]

Ego dissolution does not ordinarily eliminate phenomenology. Visual, auditory, bodily, emotional, and spatial experience remains present and may become unusually vivid, complex, or intense, although its organization is substantially altered. The principal dissociation is therefore not between consciousness and unconsciousness, but between the continued occurrence of phenomenology and the stability of the self-model that ordinarily organizes that phenomenology as happening to "me." [45, 166]

Neuroimaging findings associate psychedelic ego dissolution with broad changes in large-scale brain organization. These include reduced integrity within the Default Mode Network, altered medial-temporal and salience-network connectivity, reduced segregation between normally distinct networks, increased global cross-network communication, and changes in thalamic and thalamocortical organization. The DMN is therefore an important contributor, but ego dissolution cannot be reduced to the disruption of a single network. [45, 166–168]

Within the framework, L1 phenomenological integration remains active but resolves a radically altered biological state. Sensory and affective content may remain rich while the stable recursive organization through which L2 ordinarily maintains autobiographical continuity, ownership, and the distinction between self and world becomes weakened or fragmented. L2 is not globally abolished: recognition, communication, memory, and later report may remain possible. What becomes unstable is the virtual reference point through which these processes are normally organized around a persistent experiencer.

Because the ordinary self-model generally returns when the acute drug effect resolves, psychedelic ego dissolution represents a temporary pharmacological disruption rather than a durable reorganization of the recursive architecture. It nevertheless demonstrates that coherent narrative selfhood and phenomenology are separable. Vivid experience can continue when the ordinary experiencer, author, and self–world boundary are substantially weakened.

Psychedelic ego dissolution therefore aligns strongly with the framework's derivation of the self as a maintained downstream organization rather than the constitutive bearer of phenomenology. The case demonstrates that when the biological dynamics sustaining that organization are destabilized, the apparent self can diminish while the underlying field of phenomenological experience remains.

11.7 Bilateral Paramedian Thalamic Damage and Severe Thalamocortical Disconnection

Bilateral paramedian thalamic infarction can produce profound but variable disturbances of arousal and cognition, including coma, fluctuating responsiveness, hypersomnolence, confusion, amnesia, apathy, impaired initiation, and akinetic mutism. The clinical profile depends on the thalamic nuclei involved, the extent of the injury, and whether the lesion extends into the rostral

midbrain. Some patients recover wakefulness rapidly, while memory, executive organization, motivation, or behavioral continuity remain impaired. [169–171]

These outcomes indicate that the thalamus is not merely a passive sensory relay. Paramedian, mediodorsal, intralaminar, and central thalamic systems participate in sustaining cortical activation and coordinating recurrent communication across distributed networks. Damage to these systems can therefore produce widespread functional consequences even when much of the cortex remains structurally intact. Positron-emission tomography has demonstrated extensive cortical hypometabolism following bilateral paramedian thalamic infarction, consistent with loss of thalamocortical support rather than direct cortical destruction. [172, 173]

Within the framework, severe bilateral thalamic disruption can impair the recurrent organization required to sustain stable L1 integration and make its contents continuously available to L2 recognition, memory, and report. Local sensory registration or early cortical processing may persist, but this does not by itself establish a coherent organism-wide phenomenological state. During coma or profound unresponsiveness, the clinical evidence demonstrates a failure of stable arousal and behavioral access, although behavior alone cannot determine the exact extent of any residual phenomenology.

When wakefulness returns, the dissociation may shift. L1 phenomenology can again be present while damage to medial thalamic connections continues to disrupt memory formation, initiation, affective engagement, executive continuity, and the ability of L2 to organize experience into a stable temporally extended self-narrative. Hypersomnolence, akinetic mutism, amnesia, and loss of narrative continuity must therefore be treated as related but distinguishable consequences rather than as interchangeable measures of consciousness. [169–171]

Bilateral paramedian thalamic damage demonstrates that structurally preserved cortex and residual sensory processing are insufficient for stable conscious and cognitive integration when the recurrent thalamocortical organization coordinating them is severely disrupted. The case aligns with the framework by showing that phenomenology, report, memory, and self-referential continuity depend upon sustained integrational dynamics and can fragment in different ways when those dynamics lose a critical coordinating hub.

11.8 Progressive Dementia: bvFTD and Alzheimer's Disease

Behavioral-variant frontotemporal dementia and Alzheimer's disease both progressively alter self-related organization, but they should not be treated as producing one uniform collapse. They preferentially disrupt different neural systems and generate distinguishable changes in valuation, behavior, memory, self-awareness, and autobiographical continuity. [174, 177]

In behavioral-variant frontotemporal dementia, degeneration commonly affects frontoinsular, anterior cingulate, orbitofrontal, anterior temporal, and related salience-network systems. Patients may develop profound changes in empathy, motivation, inhibition, social conduct, emotional responsiveness, and awareness of their own behavior. They may retain consciousness, language, factual self-knowledge, and the ability to describe their established identity while failing to recognize how their personality and behavior have changed. [174–176]

Within the framework, this does not represent the complete loss of L2. It reflects degradation of the recursive organization through which organism-relative valuation, emotion, social feedback, memory, and present conduct continually update the self-model. The narrator may continue to refer to "me," yet the reference point no longer incorporates current biological and interpersonal information with its previous accuracy or affective significance.

Alzheimer's disease follows a different trajectory. Progressive impairment of episodic and autobiographical memory weakens the ability to retrieve specific personal events, connect past experience with the present, and incorporate new events into a coherent temporally extended narrative. The person's explicit account of who they are may consequently become fragmented, overgeneralized, or anchored to an earlier period of life. [177]

This loss of autobiographical continuity is not equivalent to the disappearance of phenomenology or every dimension of selfhood. Emotional responses, bodily self-recognition, familiar preferences, relational attachments, and a broad sense of identity can remain after substantial memory loss. A person may therefore experience an affective state without remembering its cause or continue to express an established identity that can no longer be accurately updated through recent autobiographical experience. [178–180]

Within the framework, Alzheimer's disease demonstrates that the temporally extended narrator depends upon the continual integration of memory into the virtual reference point. When that process deteriorates, narrative continuity and present self-updating weaken while L1 phenomenology and some affective, relational, and bodily dimensions of selfhood may remain available.

Together, bvFTD and Alzheimer's disease show that the apparent self is neither unitary nor abolished through a single mechanism. bvFTD preferentially exposes the dependence of selfhood upon affective valuation, social relevance, behavioral regulation, and accurate self-updating. Alzheimer's disease exposes its dependence upon autobiographical memory and temporal continuity. The uneven preservation and loss of these functions align with the framework's derivation of the self as a distributed, recursively maintained organization rather than an indivisible experiencer.

These disorders therefore provide a graded dissociation among immediate phenomenology, affective valuation, autobiographical memory, insight, social identity, and narrative continuity. The biological architecture can lose particular components of the authored self while other forms of experience and self-related organization remain.

11.9 Unresponsive Wakefulness Syndrome and Minimally Conscious State

Unresponsive wakefulness syndrome, formerly termed the vegetative state, is defined by wakefulness without reproducible behavioral evidence of awareness. Minimally conscious state is distinguished by inconsistent but clearly discernible signs of awareness, such as visual pursuit, localization of relevant stimuli, command-following, intelligible verbalization, or purposeful behavior. These are clinical categories based primarily on observable responses and should not be treated as direct measurements of the presence or complete absence of phenomenology. [181, 182]

At the group level, patients in a minimally conscious state generally show greater cerebral metabolism and more preserved thalamocortical, frontoparietal, and default-mode organization than patients diagnosed with unresponsive wakefulness syndrome. Patients in unresponsive wakefulness syndrome may nevertheless retain local sensory responses and active portions of the thalamocortical system. What is frequently impaired is the capacity of this local activity to develop into sustained, complex, and widely coordinated interactions. [183–185]

Within the framework, local sensory registration is not equivalent to stable L1 phenomenological integration. In many patients diagnosed with unresponsive wakefulness syndrome, sensory activity may remain biologically effective while recurrent organization is too fragmented or unstable to sustain a coherent organism-wide state that can be reliably recognized and expressed through L2. In minimally conscious state, recurrent integration occurs sufficiently—and often intermittently—to produce discernible signs of awareness, recognition, command-following, or purposeful response.

The relationship is not absolute. Some patients who show no behavioral response to commands can nevertheless perform command-dependent cognitive tasks detected through EEG or functional neuroimaging. This cognitive motor dissociation demonstrates that internally organized cognition and awareness may remain inaccessible to ordinary motor expression. A behavioral diagnosis of unresponsive wakefulness syndrome therefore establishes an absence of observable evidence, not definitive proof that all phenomenology or recursive cognition is absent. [186]

These conditions reveal that arousal, local sensory processing, phenomenological integration, cognitive access, report, and motor behavior are related but separable functions. Their average metabolic and connectivity gradients support the framework's emphasis on sustained recurrent organization, while covert consciousness demonstrates that behavioral output cannot be treated as an infallible measure of the underlying state. [183–186]

Unresponsive wakefulness syndrome and minimally conscious state therefore provide a graded but non-identical dissociation between biological integration and observable responsiveness. The case aligns with the framework by showing that stable phenomenology and report depend upon distributed recurrent organization, while the failure to produce behavior may arise from degradation of that organization, loss of access to it, failure of motor expression, or some combination of these factors.

11.10 Severe Hypoxic-Ischemic Brain Injury After Cardiac Arrest

Following cardiac arrest, global hypoxic-ischemic brain injury can produce outcomes ranging from reversible cognitive impairment to prolonged coma and persistent disorders of consciousness. The pattern and severity of injury vary considerably. Severe cases may involve widespread cortical and deep-gray structures, while selective vulnerability of the hippocampi can produce profound memory impairment even when wakefulness and other cognitive capacities later recover. [187–189]

The principal biological disturbance is not the loss of one isolated consciousness centre. Hypoxia, ischemia, and reperfusion can impair cellular metabolism, synaptic function, cortical activity, and communication across corticocortical and thalamocortical networks. When these disturbances become sufficiently widespread, local neural responses may remain while the distributed recurrent organization required for stable organism-wide integration is severely degraded. [187, 188]

Within the framework, basic sensory reactivity or isolated cortical activity should not automatically be identified with coherent L1 phenomenology. Where sufficiently organized recurrent dynamics remain, residual phenomenology or covert cognition may still be possible despite an absence of reliable behavioral response. Where severe injury prevents such organization from being sustained, L1 integration itself becomes unstable, fragmented, or unavailable.

L2 depends upon the integrated contents supplied through L1 as well as memory, recognition, comparison, and temporal continuity. Severe cortical and thalamocortical disruption therefore also compromises the capacity to maintain a coherent narrator, form intentions, follow commands, construct an autobiographical sequence, and express the resulting state through behavior. When hippocampal injury predominates, immediate phenomenology may recover while new memory formation and narrative continuity remain profoundly impaired. [189]

Severe hypoxic-ischemic injury therefore represents a graded collapse of biological organization rather than a simple loss of motor output or a selective removal of the narrator. The extent of preserved phenomenology cannot be inferred from behavior alone, but sustained consciousness and self-referential continuity become progressively less supportable as the metabolic, structural, and recurrent dynamics required for their integration are destroyed.

The case aligns with the framework by showing that local activity is not sufficient for stable phenomenology. L1 and L2 depend upon sustained organism-wide biological integration and may deteriorate together, or at different rates, according to the distribution and severity of the injury.

These cases are not exceptions to the architecture. Across ten markedly different neurological, clinical, and pharmacological dissociations, the same fixed distinctions among primary phenomenological integration, recursive self-reference,

organism-relative valuation, memory, report, and motor output remain coherent. The framework repeatedly explains the direction of separation without redefining its central components or introducing a different mechanism for each condition. This convergence constitutes strong consilience and substantial architectural explanatory power, although it does not by itself amount to definitive empirical confirmation.

Taken together, the cases also clarify the target of explanation. The problem is not how matter creates a separate "someone" who receives experience, but how a living organism's resolved biological state possesses an inside view, from which the apparent someone is subsequently constructed. The narrator, self-model, and autobiographical author are therefore not the source of phenomenology, but downstream organizations within it.

12.0 Consequences of the Organism-Relative Identity Proposition

12.1 The Zombie Flytrap

The philosophical zombie is ordinarily imagined as an organism that remains physically and functionally identical to a living counterpart while lacking phenomenology. Within the present framework, however, this formulation assumes that phenomenology can be removed while the biological process supporting the organism's response remains fully intact.

The argument that follows is therefore conditional upon the organism-relative identity proposition already developed. If the sufficiently complete bounded organism-relative event and its inside view are two descriptions of the same event rather than separable products, then the phenomenal term cannot subsequently be subtracted while leaving the complete event physically and functionally unchanged.

The Venus flytrap exposes the problem with that assumption in a comparatively tractable non-neural biological system.

When an insect perturbs the trigger hairs of the trap, the disturbance can recruit electrical and calcium-dependent signalling, temporal integration, threshold-dependent commitment, and the rapid mechanical transition through which stored elastic energy is released and the trap snaps closed. The trap does not snap merely because an external object has touched it. The perturbation must become biologically operative within the organization of the plant. [41, 65, 66, 76, 77, 84, 85]

Within the organism-relative identity proposition, if the flytrap transition satisfies the candidate identity conditions, its minimal phenomenology is proposed as the organism-relative inside view of the complete bounded event. It is not an additional property attached after the biological process has been completed. The external description identifies the electrical, chemical, energetic, and mechanical organization of the event. The inside view is that same bounded event as registered relative to the living organism undergoing it.

A zombie flytrap is therefore not produced by leaving the entire mechanism intact while subtracting an invisible phenomenal accompaniment. Within the identity proposition, to remove the flytrap's phenomenology while holding everything else fixed would require removing the organism-relative aspect of the very bounded event with which phenomenology has been identified, while simultaneously stipulating that the complete event remains unchanged.

If the organism-relative biological event itself is abolished, the perturbation cannot be selectively registered, retained, integrated, carried through threshold-dependent commitment, and resolved through the coordinated transition required for capture. The intact snap response required by the zombie premise therefore cannot remain.

Here, "dead" refers to loss of the complete living organization relevant to the zombie comparison. It does not require that every cell immediately cease metabolic activity. A damaged or unresponsive plant may retain residual biological processes, but it is no longer the fully functioning duplicate required by the zombie premise.

The imagined zombie flytrap is therefore required to preserve the complete biological process and the complete snap response while lacking the inside view of that very process. Within the framework, those conditions cannot be separated. If the complete bounded organism-relative event remains intact, then, under the identity proposition, its organism-relative inside view remains intact. If that inside view is stipulated to be absent, the proposition no longer permits the supposedly identical complete event to remain unchanged.

The force of the example lies in its simplicity. No narrator, autobiographical memory, linguistic report, reflective self, or recursive audit is required. The argument concerns the more basic relation between a living organism's detection of a consequential perturbation and the bounded biological process through which that perturbation is resolved.

Under the identity proposition, phenomenology in this minimal sense is not an optional Glow added to an otherwise complete Grind. The Glow is the organism-relative inside view of the complete Grind itself.

The supposedly functioning but phenomenologically empty flytrap is therefore not an alternative version of the same complete event within the identity proposition. The zombie premise requires the entire biologically operative transition to remain physically and functionally unchanged while simultaneously removing the organism-relative aspect with which phenomenology has been identified. The subtraction therefore preserves and abolishes the same event in different descriptions.

The zombie flytrap is a dead flytrap.

12.2 A Unifying Organism-Relative Architecture

One of the central strengths of the framework is that it identifies an organism-relative architecture capable of remaining continuous across enormous differences in biological complexity without requiring identical mechanisms at every scale. Across living systems, consequential disturbances are realized as changes to already-maintained organismic states rather than as neutral information detached from them. [24, 32, 131] Where the candidate bounded architecture is instantiated, a perturbation is selectively registered, may leave a biologically operative consequence, is integrated with present organismic condition and retained history, acquires organism-relative differential significance, and is carried through coordinated transformation and resolution.

The Venus flytrap provides a comparatively tractable expression of this organization. As established earlier, mechanical perturbation of the trigger hairs can recruit electrical and calcium-dependent signalling, persistence of prior excitation across time, threshold-dependent commitment, and the rapid mechanical transition through which stored elastic energy is released and the trap closes. External contact alone is therefore not equivalent to completion of the capture transition; the disturbance must enter and alter the organized biological state of the plant. [41, 65, 66, 76, 77, 84, 85]

The same fundamental relation can be implemented through vastly more differentiated organization in animals and humans. In mammals, organism-relative state changes can recruit neural, sensory, metabolic, autonomic, vascular, affective, and regulatory systems across wider spatial and temporal scales. [11–15, 21–24, 33–35, 42, 64, 95] Memory, prediction, valuation, cognition, and, where present, L2 recursive organization elaborate the foundational architecture without replacing it. [5–10, 68, 96–102, 107]

The continuity claimed here is therefore not a claim of identical complexity, identical biological machinery, or identical phenomenal content. What remains continuous is not one molecular mechanism but the organizing relation: a consequential perturbation becomes biologically operative relative to a maintained living system, is incorporated into a bounded state-transition, and changes the condition inherited by subsequent biological activity. The implementation can differ radically without requiring a new phenomenal principle to be introduced at each increase in biological differentiation.

Ion-channel activity, membrane potentials, calcium signalling, metabolism, ATP-dependent transport, temporal integration, threshold-dependent commitment, and adaptive response can implement different portions of this architecture in different biological systems. [32–35, 65, 66, 77, 90–94, 131–135] None is an alternative explanation of the complete event, and none by itself defines it. Abstract descriptions such as information processing or computation likewise do not replace the underlying living organization. The candidate mapped unit remains the complete bounded organism-relative state-transition in which these operations acquire their event-specific biological role.

Reversible perturbation provides an additional comparative constraint. Across widely separated biological systems, anesthetic exposure can disrupt event-relevant electrical signalling, integration, and coordinated response, with affected capacities returning as the suppressive condition recedes. [38, 40, 50, 55, 81, 126] The particular molecular actions, system-level consequences, and phenomenal implications cannot be assumed to be equivalent across substrates. The comparative significance lies instead in the reversible disruption and restoration of biological organization required for the relevant events.

The framework therefore brings selective registration, retained biological history, organism-relative valuation, coordinated transformation, reversible perturbation and restoration, and the differential energetic and regulatory demands associated with broader integration and recursive recruitment within one continuous architecture. [12, 13, 21, 24, 33–35, 42, 114–120] Increasing complexity does not require replacement of the underlying relation. It permits that relation to be implemented through progressively more differentiated forms of memory, representation, prediction, behavioural flexibility, and recursive organization.

This is not an ad hoc model constructed from human report and projected downward onto simpler organisms. The candidate bounded architecture is specified in biological terms that can be operationalized independently of language, autobiographical memory, report, or narrator-level ownership. The Venus flytrap provides a tractable comparative system in which several of those operations can be examined directly [41, 65, 66, 76–86]; animal cognition demonstrates increasingly differentiated organism-relative use of retained information [96, 122–135]; and the human case adds the extensive integrative, representational, and recursive organization associated with cognition and narrator-level self-reference. [5–10, 23, 24, 33–35, 42, 64, 68, 69, 90, 91, 95–107]

The significance of this continuity lies in what follows under the organism-relative identity proposition. The framework does not introduce phenomenology as a separate property added to a completed biological mechanism at some arbitrary level of evolutionary complexity. Wherever a sufficiently complete bounded organism-relative transition satisfies the candidate identity conditions, primary phenomenology is proposed as the organism-relative inside view of that complete event. Electrical, ionic, metabolic, mechanical, neural, vascular, autonomic, and regulatory processes can contribute to its physical implementation, but none considered in isolation is the Glow.

The cross-scale consequence is therefore not that increasingly complex biology begins producing Glow. Increasing biological differentiation elaborates the Grind while the proposed identity relation remains unchanged. No additional phenomenal mechanism or post hoc explanatory bridge is required when the architecture passes from non-neural biological organization into increasingly differentiated animal cognition or, later, into human recursive organization.

As biological organization becomes more differentiated, bounded events can acquire greater spatial integration, temporal depth, memory dependence, representational flexibility, behavioural range, and recursive organization. Under the identity proposition, such organizational differences constrain corresponding differences in the inside view without requiring phenomenology to be treated as a separately added property. In humans, memory-dependent cognition and L2 recursion permit present conditions to be organized through retained past, anticipated future, psychological time, attribution, and narrator-level ownership. [5–10, 68, 69, 96–107]

The framework thereby preserves continuity without flattening biological difference. It neither projects the human narrator onto the Venus flytrap nor places human phenomenology beyond an unexplained evolutionary boundary. The flytrap bounded transition, increasingly differentiated organism-relative animal cognition, and the highly elaborated human architecture represent different biological implementations of the same proposed organism-relative relation. That architectural continuity does not, by itself, locate the phenomenal boundary along phylogeny.

Under the organism-relative identity proposition, no second biological process is introduced to generate the Glow once the candidate bounded event is complete. Where the identity conditions are satisfied, the complete organism-relative state-transition and its phenomenal inside view are not two causally connected events. They are the same event described from its external biological organization and its organism-relative inside view.

13.0 Reducing the Irreducible

13.1 The Apparent Irreducible Remainder

Even if the preceding biological account is accepted, the final and most persistent objection remains: “The mechanisms may follow physics, but why is there anything it is like from the inside?” [25, 26]

The objection appears to identify an irreducible remainder beyond the biological process. Under the organism-relative identity proposition, however, primary phenomenology is not an additional property produced after the biological event has been completed. It is proposed as the organism-relative inside view of the sufficiently complete bounded organism-relative state-transition. The Glow is not added to the Grind as a second event or product; it is the inside view of the complete Grind itself.

The argument that follows therefore does not attempt to derive phenomenology as an effect produced by non-phenomenal biology. It examines why an additional irreducible recipient appears necessary once the downstream narrator is projected backward into the event.

Primary organism-relative phenomenology does not require an independently existing self, narrator, or owner. The formulation “what it is like for me,” however, is already a downstream construction. It requires recursive access, memory, comparison, conceptualization, and the organization of experience around a virtual reference point extended through remembered past and projected future. [5–10, 68, 69, 96–102, 107]

The narrator does not generate the primary Glow. It interprets, reconstructs, appropriates, and represents an antecedent phenomenal event as something happening to “me.” Reportability belongs to this recursive layer. Attenuation or absence of L2 recursive organization does not, within the framework, entail abolition of L1 primary phenomenology, although narrator-level ownership, autobiographical retention, conceptual description, and report may be correspondingly reduced or unavailable.

This distinction is essential because thought operating through psychological time is not merely a passive report of an antecedent event. Representational content can function as a new present internal stimulus. A reconstructed memory, anticipated loss, comparison, feared outcome, resistance, regret, or projected future may therefore recruit or modify a further organism-relative biological state-transition. That transition is a new present event rather than an alteration of the antecedent L1 event. Its resulting biological condition and representational content can then become fresh conditions for subsequent cognition. [9, 10, 12, 13, 114–116]

The sequence is recurrent rather than a single event endlessly acting upon itself:

> primary organism-relative event → recursive representation and attribution → representation functions as a new present internal stimulus → further organism-relative state-transition → resulting state and representational content become conditions for further recursive processing.

Rumination is one expression of this architecture. Thought repeatedly reconstructs or projects content through psychological time; that content functions as a present internal stimulus; the resulting biological consequences become new present conditions; and those conditions can recruit further thought without requiring another external event. [12, 13, 21, 117, 119]

This recursive organization does not generate phenomenology from nothing. It can sustain the division through which phenomenology, memory, valuation, and internally generated stimuli are repeatedly organized around an apparent owner. Sustained recursive recruitment can in turn carry additional metabolic, autonomic, and regulatory demands. [12, 13, 21, 33–35, 42, 114–120] The same organization can then represent itself as an observer standing apart from the friction generated within the movement in which it participates.

Every affirmative conceptual description or report of "what it is like" belongs to this downstream architecture. To describe an experience is to recognize it, distinguish it, retain or reconstruct it through memory, compare it with other states, and formulate it as conceptual content. The description may provide evidence concerning the primary phenomenal event, but it cannot reproduce that event in its pre-reflective form.

The difficulty is therefore not merely that the condition is unusually subtle or ineffable. It is architectural.

The organization required for affirmative conceptual description reintroduces narrator-level distinction, memory, comparison, and psychological time into the representation of a condition defined by their absence.

This becomes especially important in relation to timeless awareness. Within the present framework, "timeless awareness" does not mean awareness outside chronological or biological time. Chronological succession continues. Biological processes unfold. Sensory registration, integration, regulation, state-transition, and resolution continue. Practical memory and the capacity for future-oriented action need not disappear. "Timeless" refers instead to primary organism-relative phenomenology not presently organized through psychological time—the temporal organization intrinsic to memory-dependent conscious thought itself.

Where psychological time is not actively organizing the present event, the recursively maintained narrator is not functioning in the same form as an apparent owner standing apart from experience. The biological process continues, and primary organism-relative phenomenology may remain, but the organization that would represent the condition as "my experience of timeless awareness" is not operating in that same form.

Such awareness is literally ineffable in the restricted architectural sense developed here. The interval in which psychological time is absent cannot itself be positively described in words, because description requires the memory-dependent recognition, distinction, comparison, and conceptual organization whose operation ends the very condition being described. A later report may indicate that such an interval occurred, but it cannot reproduce or positively describe the interval itself. The remembered description is a new narrator-level event; it is not the condition to which it refers. The silent interval between two thoughts cannot be positively described, because the narrator required for description is absent from the interval itself. If descriptive thought is present, there is no silent interval. A later report can indicate that such an interval occurred, but it cannot describe the silence itself; the report belongs to the subsequent return of thought, not to the interval it attempts to represent.

The moment the condition is named, possessed, remembered, compared, or represented as "my experience," psychological time is again operating. What can be described are its boundaries, the conditions associated with its occurrence, or the biological and psychological organization absent from it—not the condition itself as positive conceptual content. It can therefore be indicated most accurately through negation: not outside biological time, but without autobiographical projection; not without primary organism-relative phenomenology, but without narrator-level appropriation; not the disappearance of awareness, but the absence of the division between an apparent observer and what is observed.

This does not make timeless awareness supernatural, metaphysically detached, or biologically inexplicable. Its resistance to positive description follows from the architecture itself. The memory-dependent conceptual organization required to describe the absence of psychological time necessarily operates through psychological time in producing the description.

The remaining objection therefore cannot be settled by treating the narrator's reconstructed image of phenomenology as the primitive explanandum. The narrator compares the biological explanation with an experience already represented as private, owned, and presented to an inner subject. It then treats the failure of biology to reproduce that downstream representation as evidence that an irreducible remainder persists.

But the apparent owner invoked by the demand is not present within primary phenomenology as an independently existing recipient. It is generated through the later recursive organization of phenomenology, memory, valuation, comparison, attribution, and projection.

When the recursively generated division is recognized as a product of thought rather than evidence of an independent observer, the apparent irreducible remainder changes form.

What remains is not phenomenology awaiting delivery to an unexplained self. It is the organism-relative inside view of the complete bounded event, together with the downstream biological architecture through which that event becomes recognized, remembered, conceptually described, and retrospectively claimed as belonging to "me."

The problem does not dissolve because phenomenology has been denied. It is reduced because the assumed independent experiencer has been removed from the starting conditions of the explanation and returned to the recursive process through which the appearance of that experiencer is generated.

13.2 The Observer is the Observed

When the illusory self—the conditioned, late-arriving narrator—acts as the observer and looks at a tree, it is not encountering raw phenomenology in its primary present form. What it "sees" is the recognition of something encountered a thousand times before: the bark labeled "bark," the rough texture of the trunk, the lush green of the leaves. The conditioned self does not encounter the living tree as an unmediated object in the now; it encounters "tree" through an accumulated image reconstructed from past experience, labels, and memory within the movement of thought as psychological time. [29, 71, 96, 99, 106] The observer is not observing the tree — the observer is only ever observing its own conditioned image of the tree. Therefore, the relationship is not between the observer and the tree, but between the observer and the recreated image of the tree.

Just as the observer does not see the tree itself but encounters the conditioned image through which "tree" is recognized, the conditioned self does not directly encounter primary phenomenology as an object of inspection, but only its accumulated and reconstructed image of what subjectivity should be. When it demands an explanation of "why there is anything it is like from the inside," or insists that some positive description of qualia is still missing, it is not encountering primary phenomenology in its original form. It is encountering its own accumulated mental image of what "what it is like" should be—a construct built through memory, expectation, labeling, and prior conditioning within the movement of thought as psychological time. The observer is therefore not observing "what it is like." The observer is only ever observing its own accumulated mental image of what it is like.

This illusion is also exposed by the underlying biological constraint. Many people operate under the assumption that they are a controller positioned behind the eyes, looking directly out at a real tree. In physical terms, photons reflected from the tree reach the retina and initiate sensory transduction. The resulting biological activity undergoes unavoidable non-zero transmission and distributed perceptual processing before that event becomes available for narrator-level recognition within L2 recursive organization. [106, 136, 137, 190] By the time the narrator registers "I am seeing the tree," the initiating optical event has already been biologically transformed, recognized, and organized through retained memory and labeling within the movement of thought as psychological time. [71, 96, 99, 106, 136, 137] The narrator therefore does not directly observe the tree in its primary present form. It encounters a post-hoc reconstruction of an event that has already passed through the organism's perceptual architecture. The apparent observer is not an entity receiving this reconstruction from outside the process. It is the recursively generated virtual reference point produced within the same living system through which the event is processed, recognized, reconstructed, and attributed.

The observer is generated within what it claims to observe. The observer is the observed.

14.0 What It's Like to Be a Category Error: Biological Constraint and the Apparent Subject

14.1 The Malformed Question and the Category Error

The architecture developed in the preceding sections changes the form of the hard problem before any answer to it can be attempted. Questions such as why physical processing produces subjective experience, why there is anything it is like from the inside, or how objective biological activity gives rise to experience for a subject appear to ask about the relation between physical process and phenomenology. But these formulations commonly contain an additional architectural assumption: they presuppose something to which phenomenology is presented, something that receives it, possesses it, observes it, or experiences it. [25, 26]

What appears initially to be a two-term explanatory relation,

$$physical\ process \rightarrow phenomenology$$

is therefore often transformed, implicitly, into a three-term relation:

$$physical\ process \rightarrow phenomenology\ belonging\ to\ an\ experiencer$$

The second formulation is not merely another way of expressing the first. It introduces an additional term and assigns that term an explanatory role. Phenomenology is no longer simply the phenomenon to be explained. It is now treated as something occurring for, presented to, or possessed by an experiencer.

That additional term cannot be introduced innocently. If an experiencer is required as the recipient or owner of phenomenology, then its biological organization, causal role, temporal position, and ontological status must themselves be established. Yet the traditional formulation commonly grants the subject primitive status before any of these questions have been answered. The subject is placed at the beginning of the explanatory problem as though its existence and architectural position were already given.

The preceding analysis has instead derived the relevant apparent subject—the narrator-level "me"—within the biological architecture itself. Its implementation is material and causally consequential, while the independent owner represented through that implementation is a virtual reference point. Recursive memory, comparison, attribution, projection, and organism-relative indexing generate and maintain the narrator. They are not operations initiated by a narrator that already existed beforehand. [33–35, 42, 68, 69, 90, 91, 96–103, 107]

The narrator is therefore not omitted from explanation. It has been returned to the process through which its apparent independence is generated.

This introduces a direct physical constraint on where narrator-level ownership can occur.

Narrator-level recognition, attribution, ownership, and report require biological activity. Transmission takes time. Integration takes time. Memory access, comparison, recursive processing, recognition, and attribution likewise depend upon physical operations that cannot be completed before the antecedent activity on which they rely. [90, 91, 103, 104, 136, 137]

The already-established System Latency relation can therefore be stated compactly as:

$$t\ L2 > t\ L1$$

where t_L2 denotes the temporal availability of narrator-level recognition or ownership and t_L1 denotes the antecedent organism-relative event upon which that later organization depends.

System Latency does not generate phenomenology. Its significance here is narrower and decisive: narrator-level ownership cannot occupy the antecedent causal-temporal position.

Narrator-level recognition, attribution, and ownership require finite physical operations. Those requirements exclude the defined narrator-level owner from the earlier temporal position assigned to it by the inherited formulation.

A later reference structure cannot become the primitive recipient of an event whose prior processing is required for that reference structure to arise.

The resulting reversal can be stated schematically. The inherited formulation tends to imply something like:

$$subject \rightarrow receives\ experience \rightarrow interprets\ world$$

The architecture derived in the preceding sections instead places the apparent subject downstream:

$$organism\text{-}relative\ event \rightarrow recursive\ recognition/attribution \rightarrow virtual\ subject$$

This schematic is intentionally compressed. The full biological and recursive architecture has already been derived elsewhere. What matters here is the direction of explanation.

The apparent subject is not present at the beginning as an ontological bearer waiting for phenomenology to arrive. The narrator-level reference point becomes available only through biological and recursive operations occurring within the organism.

The reversal is therefore not metaphorical. A downstream biological construction is being assigned to an earlier architectural category.

This is the first sense in which the inherited question is malformed.

It asks biology to explain how phenomenology occurs for a recipient that must already be present at the beginning. But the architecture places that narrator-level recipient later, after the biological operations required for its generation. The downstream functional reference is projected backward and treated as though it were the pre-existing subject that received, witnessed, authored, or owned the process from the beginning.

The problem is also incomplete, and this is a separate defect.

If a theory begins by asking how experience arises for a subject, while the subject itself is a biological phenomenon requiring explanation, then one of the central products of the system has been removed from the explanatory programme and inserted as an unexplained starting condition.

The question asks how phenomenology reaches the experiencer without first asking how the experiencer appears.

Ownership, authorship, observation, self-reference, and report cannot be treated as secondary details once the subject possessing those properties has already been built into the original formulation. The subject invoked by the question is itself part of what a theory of consciousness must explain.

The hard problem is therefore not only malformed. It is incomplete.

This distinction matters. The framework does not resolve the difficulty by declaring that there is no organism, no phenomenology, no cognition, or no first-person organization. Nor does it simply delete the apparent subject as though nothing biologically real corresponded to self-related processing.

The implementing processes are real, materially instantiated, causally consequential, and empirically tractable. What the architecture removes from the starting conditions is the additional assumption that their virtual referent already existed as an independent recipient before those processes generated it.

Once the narrator has been derived rather than assumed, the phrase experience for a subject can no longer function as a conceptually neutral starting point. It imports into the explanandum a subject whose own generation belongs within the explanation.

The primitive experiencer required by the inherited formulation is therefore not recovered at the causal-temporal position in which the question places it. What the biological architecture recovers is a later, materially implemented reference structure through which an organism can recognize, attribute, remember, report, and claim an event as “my experience.”

The apparent subject is not the precondition of that architecture. It is one of its products.

System Latency provides the initial physical exclusion. The remaining question is whether this downstream placement is peculiar to a single temporal argument or whether independent perceptual, nociceptive, cognitive, ownership, agency, and self-location evidence converges on the same architectural result.

That is the question to which the next subsection turns.

14.2 Empirical Exclusion of the Primitive Observer

The preceding subsection established an initial physical constraint: the defined narrator-level owner cannot occupy the antecedent temporal position required for it to function as the primitive recipient of the event it later recognizes and claims. The question now is whether this conclusion depends upon one timing argument or whether independent empirical domains converge on the same architectural placement.

The strength of the empirical case lies in convergence. The properties ordinarily attributed to a unitary primitive observer—explicit recognition, ownership, self-location, authorship, introspective access, and report—do not behave experimentally as inseparable properties of one antecedent subject. They depend upon biological operations that can be temporally separated, experimentally manipulated, or selectively disrupted.

System Latency supplies the general physical constraint. Recognition, attribution, ownership, introspection, and report all require biological processing, and that processing takes time. The narrator-level observer therefore cannot already occupy the earlier position from which those operations arise. Its downstream position is not merely one interpretation of the evidence; it follows from the physical requirements of the processes themselves. [90, 91, 103, 104, 136, 137]

The question is whether independent experiments point to the same conclusion.

Controlled nociceptive perturbation makes the temporal ordering particularly clear. A controlled mechanical, thermal, electrical, or comparable nociceptive stimulus initiates a physically ordered sequence involving receptor transduction, peripheral afferent transmission, spinal and brainstem processing, distributed central processing, and later operations supporting discrimination, decision, motor preparation, and overt report. These stages can overlap, recur, and interact, but their causal dependencies cannot be abolished. Information that has not yet been transmitted cannot already have been integrated, and a report cannot occur before the processes required to generate that report have taken place.

This does not identify nociception with pain, nor does it establish an exact temporal onset for pain phenomenology. Its significance here is narrower. The controlled sequence shows that discrimination, rating, ownership, and report occupy later, causally constrained positions relative to antecedent biological processing. The narrator-level statement “I am in pain” therefore cannot be projected backward as evidence that the explicitly recognizing and reporting subject was present throughout every earlier stage of the event. [27, 28, 60]

Visual no-report paradigms provide an independent constraint. In binocular rivalry, Frässle and colleagues tracked perceptual alternations using objective ocular measures while removing the requirement for continuous active report. Perceptual transitions remained measurable, while frontal activity associated with introspection and action was substantially reduced. [191] Subsequent report/no-report studies likewise separated perceptual processing from later activity recruited when participants were required to explicitly categorize or report what they had seen. [30, 192, 193]

Pitts and colleagues distinguished activity associated with perceptual awareness from activity associated with task relevance and report. Cohen and colleagues likewise found a robust late P3b when visible stimuli had to be reported, but not when visible stimuli occurred under no-report conditions. [192, 193]

These findings do not provide direct access to phenomenology, nor do they establish that every late or frontoparietal process is irrelevant to consciousness. They establish the narrower point required here: active report recruits additional biological operations and is not identical to the perceptual event being reported.

The same distinction is not confined to vision. Somatosensory no-report experiments provide cross-modal convergence. Giorgi and colleagues manipulated task relevance and report requirements for tactile stimuli. The P3b was closely associated with task relevance and was absent in the no-report condition, while sensory-awareness-related responses could be distinguished from this later task/report component. [194]

Visual and somatosensory processing are not identical biological systems, but the architectural result converges. In both domains, later task and report operations can be separated from processing associated with the sensory event itself.

Meta-awareness provides a different kind of dissociation. In the focused-attention paradigm examined by Hasenkamp and colleagues, the observed cognitive sequence distinguished mind wandering, subsequent awareness that mind wandering had occurred, attentional shifting, and renewed sustained attention. [149]

The result is simple but important. Mind wandering can already be occurring before the person becomes explicitly aware that the mind has wandered. The later recognition—effectively, “my mind was wandering”—therefore cannot have initiated the episode it recognizes.

That later recognition can still matter. Once it occurs, attention can be redirected and subsequent processing can change. But the order remains clear: the cognitive process is already underway before narrator-level recognition of that process appears.

This separates the occurrence of thought from the later recognition of thought.

Bodily ownership provides another independent line of evidence. The rubber-hand illusion demonstrates that ownership can extend toward an artificial limb when visual, tactile, and proprioceptive information are appropriately coordinated. Neurological cases such as somatoparaphrenia demonstrate the complementary dissociation: ownership can be weakened or withdrawn from a biological limb that remains physically part of the organism. [140–143]

These findings place an important constraint on the status of “mine.” Ownership is not an invariant property simply supplied by an inner owner. It depends upon biological integration that can be experimentally manipulated or clinically disrupted.

The ownership relation itself is real as a biological and representational process. What the evidence undermines is the further inference that this relation must be produced by an independently existing owner already standing behind bodily experience.

Self-location is similarly alterable. Multisensory manipulations and focal disturbances of bodily integration can shift experienced self-location, bodily perspective, or the apparent position from which the body is encountered. The physical body has not literally moved to the newly experienced location. What has changed is the organization through which bodily position and perspective are represented. [140, 144, 145]

The apparent location of “where I am” therefore cannot simply be read from the fixed position of an ontological observer permanently situated somewhere within the organism. Self-location is another property attributed to the unified subject that depends upon alterable biological organization.

Intention, movement, and experienced authorship provide a further decomposition. Experimental manipulations can dissociate intention, movement, awareness of movement, and experienced self-authorship. Direct cortical stimulation has produced circumstances in which intention occurs without the expected movement, movement occurs without the expected sense of self-authorship, or awareness of movement becomes dissociated from the processes initiating it. Other paradigms demonstrate that contextual information can alter whether an action is experienced as self-authored. [20, 148]

These dissociations do not make action selection, inhibition, planning, behavioural regulation, or action itself unreal. They remain causally effective organismic processes. What the evidence challenges is the inference that experienced authorship transparently reveals a unitary inner controller occupying the antecedent causal position.

Experienced authorship is itself biologically organized. Its presence cannot by itself establish that an independent controller occupied the antecedent causal position.

The same issue extends beyond bodily action to the authorship of thought. Klock and colleagues experimentally manipulated whether healthy participants believed that a purported technical device could influence their stream of consciousness. When participants believed the device was active, they reported a reduced sense of self-authorship and attributed more thoughts to the purported external source. [195]

The experimental result concerns something very specific: the attribution of authorship.

A thought can occur while the attribution “this is my thought” is experimentally altered. Thought generation and thought authorship are therefore not the same operation. The sense of “my thought” is an additional, biologically alterable attribution rather than an indivisible property supplied by a primitive thinker.

The significance of these findings lies in their independence from one another. Controlled nociception, visual no-report, somatosensory report manipulation, meta-awareness, bodily ownership, self-location, experienced authorship of action, and thought authorship are not different measurements of one biological process. They test different properties ordinarily attributed to the supposedly unitary primitive observer.

The force of the convergence lies in this independence.

Temporal evidence constrains when narrator-level ownership can occur. No-report paradigms separate perceptual processing from the additional operations required for active report. Meta-awareness shows that cognition can precede explicit recognition of that cognition. Ownership can be assigned or withdrawn. Self-location can shift. Intention, movement, and experienced authorship can be dissociated. Even the attribution “my thought” can be experimentally altered. [20, 27, 28, 30, 60, 140–145, 148, 149, 191–195]

These are different experimental attacks on different properties attributed to one supposed inner subject.

The resulting picture is not that self-related processing somehow disappears. Those processes are physically implemented, causally consequential, and biologically maintained. What the evidence fails to recover as an independent primitive is the owner supposedly standing behind them.

Instead, the functions attributed to that owner progressively resolve into distinguishable biological operations.

For the defined narrator-level observer—the organization that explicitly recognizes, attributes, owns, introspects, and reports—the convergence therefore reinforces the physical conclusion already established by System Latency. It cannot occupy the primitive antecedent position assigned to it by the inherited subject–experience formulation.

The convergent evidence therefore empirically establishes the temporal and architectural constraints underlying the Category Error as defined here.

The apparent owner is generated downstream, yet the traditional formulation places that owner at the beginning, as though it were already present to receive and possess the event.

That is the error: a product of the process is assigned the position of the subject that supposedly preceded the process.

The empirical conclusion is deliberately specific. These experiments separate the functions attributed to the supposed primitive observer, demonstrate that those functions depend upon alterable biological processes, and constrain where those processes occur within the causal architecture.

When the inherited formulation assigns those downstream functions to a primitive antecedent subject, the temporal and architectural misassignment becomes explicit.

The convergence also exposes the next problem. Perceptual occurrence, explicit recognition, ownership, authorship, introspection, and report can no longer simply be treated as one indivisible event already possessed by one primitive observer. They are related within a continuous biological architecture, but they are not the same operation and they do not occupy the same causal position.

The next question is therefore conceptual as well as biological: how did these distinguishable processes come to be compressed into the single category commonly called "subjective experience"?

That is the question to which the next subsection turns.

14.3 The Central Conflation and the Correct Explanatory Target

The preceding subsection established that functions commonly attributed to a single primitive observer can be separated biologically and experimentally. Perceptual processing, explicit recognition, ownership, self-location, authorship, introspection, and report do not occupy one indivisible causal position. Once those distinctions are visible, a second problem in the traditional formulation becomes apparent. [20, 30, 72, 107, 140–149, 191–195]

The problem is not only that an experiencer is assumed before that experiencer has been derived. Distinct processes are also routinely compressed into the single category of "subjective experience," as though phenomenology, recognition, ownership, introspection, memory, and report were different names for one event.

They are not.

They may interact rapidly and recurrently within one continuous biological architecture, but continuity does not make them functionally or temporally identical. A useful first distinction is therefore:

$$primary\ phenomenology \neq access \neq recognition \neq ownership \neq report$$

Memory and introspection belong within the same architecture, but they introduce additional operations of their own.

Primary phenomenology refers here to the organism-relative inside view of the relevant biological event before explicit narrator-level ownership. "Primary" identifies its architectural position. It does not imply biological simplicity, passivity, or an isolated stage waiting for later processes to begin.

Access concerns whether aspects of an event become available to further processing. Recognition relates present content to retained representations, learned categories, or prior history. Memory allows aspects of an event to be retained, reconstructed, and made available later. Ownership represents an event as happening to "me" or as being "my experience." Report converts selected aspects of the event and its later organization into communicable form.

These operations can occur rapidly and influence one another. But they do different work.

The central conflation occurs when the primary phenomenal event is treated as though it were already explicitly known, recognized, remembered, introspectively inspected, owned, and available for report. Several explanatory problems are then compressed into one apparent object called "subjective experience."

The resulting object appears extraordinarily difficult to explain because biology is no longer being asked to explain phenomenology alone. It is being asked to explain phenomenology together with access, memory, recognition, ownership, introspection, report, and the apparent subject to whom the entire package supposedly belongs.

The explanatory target has been inflated.

Reportability provides a clear example of the problem. A report requires biological operations beyond the occurrence of the event being reported. Some aspect of the event must become available for selection, retention, reconstruction, behavioural organization, and, where applicable, language. [30, 62, 191–194]

For that reason:

$$phenomenology \neq reportability$$

Failure to report an event cannot by itself establish that primary phenomenology was absent. Language can fail. Memory can fail. Motor output can fail. Access required for a particular task can fail. None of these failures, considered alone, establishes that the primary organism-relative event did not occur. [30, 31, 73, 186]

The reverse distinction matters as well. The presence of a report does not make the report a transparent copy of the original event. By the time an event is reported, it has already been subjected to further recognition, selection, memory, interpretation, and recursive organization. [30, 62, 191–194]

The report is evidence about the event. It is not the event itself.

This does not make report scientifically unimportant. Report remains one of the principal ways in which aspects of phenomenology become available for empirical investigation. The distinction is architectural: evidence concerning an event should not be substituted for the event itself.

A deeper version of the same problem appears when the narrator reconstructs phenomenology through thought.

Remembering an earlier event requires present biological activity. So does imagining a future event, reconstructing a perception, or forming the thought "this is what my experience was like." Those physical processes are real and biologically tractable. But the content reconstructed through them must not be confused with the event to which that content refers. [9, 10, 96, 114, 115]

A remembered past is not the past event physically reinstated in the present. An imagined future is not a future event made physically present by being represented. The biological process through which either representation occurs can be mapped, but the represented referent is not thereby recreated as an additional physical event.

The distinction can be stated directly:

$$present\ physical\ reconstruction \neq represented\ event\ made\ physically\ present$$

The same constraint applies when phenomenology itself becomes the object of later thought.

$$primary\ phenomenology \neq later\ representation\ of\ phenomenology$$

The biological process through which phenomenology is remembered, labelled, compared, owned, or reported is physically tractable. But the narrator's reconstruction of the earlier phenomenal event is not the earlier phenomenal event made present again. It is a later representation generated through the organism's continuing activity.

This introduces an additional Category Error into the traditional formulation of "subjective experience." The phrase can shift unnoticed from the primary phenomenal event to the narrator's later representation of what that event was "like." Biology is then asked to explain not only phenomenology, but the reconstructed conceptual product through which phenomenology is subsequently recognized and described.

The hard problem becomes artificially insoluble when biology is asked to explain not only phenomenology, but the narrator's reconstructed representation of what phenomenology is "like."

The error is subtle because the later representation refers back to the earlier event. That relation does not make the two identical. A physical process can generate a representation of an earlier event without reproducing the earlier event itself. To substitute the later representation for primary phenomenology is therefore to change the explanatory target while continuing to use the same word—"experience"—for both.

Introspection creates a related confusion. Introspection is often described as though an inner subject were directly inspecting a private phenomenal object. But within the present architecture, introspection is itself another biological operation. The organism recursively represents, compares, labels, and sometimes reports aspects of its own ongoing or prior activity. [107, 149]

No additional witness is introduced by this operation.

$$introspection \neq direct\ observation\ by\ an\ independent\ inner\ witness$$

Introspective access can therefore provide information about an event without placing an observer outside the biological process. The organism is processing aspects of its own activity from within the same architecture that produced the activity being examined.

A biological perspective does not require a separate biological spectator.

The term "qualia" can conceal a similar conflation. Colour, pain, taste, sound, bodily sensation, and affective quality refer to genuine dimensions of phenomenology within the framework. Nothing in the present argument requires their denial.

The problem begins when immediate qualitative phenomenology is silently equated with its later recursive representation as private, possessed, explicitly recognized, ineffable, or belonging to a narrator.

These are different claims:

$$immediate\ qualitative\ phenomenology \neq recursive\ representation\ of\ qualitative\ phenomenology$$

A painful quality need not first be represented as "my private pain" in order for the painful event to occur. A colour need not first be conceptually recognized, remembered, or attributed to a self in order to possess phenomenal character. Later recognition and ownership can profoundly alter what follows, but they should not be inserted into the definition of the primary event itself.

The phrase "subjective experience" requires the same care because it can carry two importantly different meanings.

In one sense, "subjective" identifies an organism-relative perspective. The event occurs through the organization of a particular living organism, in relation to that organism's present condition, history, sensory organization, and biological constraints. There is no view from nowhere.

In another sense, "subjective" is taken to mean experience possessed by an independently existing subject standing behind the event.

The first usage identifies a biological perspective.

The second introduces an ontological claimant.

Those two meanings should not be treated as interchangeable. Organism-relative phenomenology does not require that the event be presented to an additional observer. The perspective belongs to the organization of the living system itself.

The correction of the explanatory target can therefore be stated directly.

> **The primary target is phenomenology itself: the organism-relative inside view of the relevant bounded biological event.**

Recognition, memory, introspection, ownership, autobiographical interpretation, and report remain legitimate explanatory targets, but they are downstream targets. They explain how an event becomes recognized, reconstructed, attributed, incorporated into a continuing self-reference, and communicated. They should not be built into the definition of phenomenology before the biological relation to phenomenology is investigated.

This distinction is especially important for the Mapping Theorem. The theorem adopts the corrected target rather than generating the correction anew. Its primary mapping concerns organism-relative inside-view phenomenology, not the narrator that later claims the event, the interpretive labels attached to it, autobiographical ownership, or report.

That is the only Mapping-Theorem distinction required here.

The consequence for the explanatory gap is substantial. If a biological correlate of report, metacognition, memory, recognition, or ownership is treated as though it were the correlate of phenomenology itself, the scientific target has already shifted downstream. If the narrator's later reconstruction of phenomenology is then treated as though it were phenomenology itself, the target shifts again. If an independently existing owner is finally added as the supposed recipient of the resulting state, the explanatory burden grows once more. [30, 62, 107, 191–194]

> Biology is first asked to explain phenomenology.
>
> Then access.
>
> Then recognition and memory.
>
> Then introspection and ownership.
>
> Then the reconstructed representation of what the event was "like."
>
> Then report.
>
> And finally the independent subject supposedly possessing the entire composite.

The resulting difficulty can appear irreducible because several different explanatory problems have been compressed into one.

Deconflation does not by itself establish the proposed biological identity relation. It performs a different and necessary task: it identifies what that identity relation must actually explain.

Primary phenomenology, access, recognition, memory, introspection, ownership, reconstruction, and report belong to one living architecture, but they are not interchangeable categories. The primary phenomenal event does not become more real when it is recognized, remembered, owned, or reported. Those later operations alter what the organism can do with the event and how the event becomes represented, but they do not retroactively constitute its first phenomenal occurrence.

Once these levels are separated, the explanatory problem becomes more precise. The relevant question is no longer how a complete package called "subjective experience"—already containing an observer, ownership, introspection, memory, reconstruction, and report—somehow emerges from biology.

The primary question concerns the relation between the bounded organism-relative biological event and phenomenology itself.

The downstream questions concern how that event becomes accessible, recognized, remembered, reconstructed, owned, interpreted, and reported.

The "why isn't it dark?" formulation preserves the same category error in negative form. It treats phenomenology as an optional addition to an otherwise complete biological event, just as the traditional hard problem treats the experiencer as an independent subject to whom that phenomenology must be delivered. Both formulations therefore begin by separating what the framework derives as aspects of one organism-relative process.

One major puzzle nevertheless remains.

If the narrator-level owner is downstream, and if phenomenology can be distinguished from its later recognition, reconstruction, and ownership, why does that owner nevertheless appear immediate, prior, and self-evidently fundamental?

The answer lies in the form in which recursive processing presents its own products.

> **The product conceals its production.**

14.4 The Product Conceals Its Production

The preceding analysis leaves an important question. If the narrator-level owner is downstream, and if primary phenomenology can be distinguished from its later recognition, reconstruction, ownership, and report, why does the owner nevertheless appear immediate, prior, and fundamental?

The answer lies in the form in which the result is represented.

The narrator does not appear within experience as a constructed output. It does not announce itself as a virtual reference point produced through prior biological and recursive organization. It appears instead as the centre from which perception, thought, memory, intention, and action seem to proceed:

> "I am seeing."
> "I am thinking."
> "I remember."
> "I chose."

By the time these contents become available in explicit first-person form, the biological and recursive conditions required for narrator-level attribution are already in place. Yet the complete history through which that attribution arose is not ordinarily presented alongside the resulting first-person representation.

The product conceals its own production.

The concealment examined here concerns the narrator-level reversal of authorship and ownership; it does not require a separate failure of access to hidden biological machinery, nor does it replace the more primitive organism-relative concealment developed elsewhere.

Thought appears as "my thought." Memory appears as "my memory." Perception becomes "what I see." Fear becomes "my fear." Action becomes "what I chose."

The point is not merely grammatical. These expressions reflect an organization in which changing content is indexed to a relatively stable reference point. Once the content arrives already organized as mine, that reference point appears to be the prior owner from which the content originated.

The underlying architecture and the apparent self-description therefore run in opposite directions.

The derived architecture proceeds approximately as:

$$\textit{organism-relative processing} \rightarrow \textit{recursive organization} \rightarrow \textit{virtual reference point} \rightarrow \textit{first-person attribution}$$

The apparent order is:

$$\textit{independent subject} \rightarrow \textit{perception},\ \textit{thought},\ \textit{memory},\ \textit{and action}$$

No independent biological architecture corresponding to the second sequence has been identified. It is the self-description generated by the recursive system.

The causal order is thereby reversed in representation.

This is why apparent priority must be distinguished from temporal and causal priority. The narrator can appear to have been present from the beginning even though the physical operations required for narrator-level recognition and ownership depend upon antecedent processing already established in the preceding sections.

Apparent priority is not temporal priority. Apparent priority is not causal priority.

This distinction has direct empirical support. The experienced timing of intention itself can be reconstructed.

Lau, Rogers, and Passingham applied transcranial magnetic stimulation over pre-supplementary motor areas after an action had already been performed and altered participants' reported timing of when the intention to act had occurred. [196] Banks and Isham likewise showed that manipulated feedback following an action could shift reported decision timing. [197] Rigoni and colleagues linked post-action processing to changes in the reported time of conscious intention, [198] while Douglas and colleagues found that reported movement-intention timing depended upon temporally extended neural activity spanning periods both before and after movement. [199]

Their relevance here is specific: the reported temporal position of intention can be influenced by processing occurring after action execution.

The experienced temporal position of intention is therefore not a transparent record of when an independent intending subject entered the causal sequence.

Post-action processing can influence when intention is subsequently reported as having occurred. Introspective antecedence therefore cannot by itself establish causal antecedence. [196–199]

This provides a concrete example of the larger representational problem: a state can be experienced as having occupied an earlier position even though the representation of that position depends upon later biological processing.

Ownership follows the same logic.

A perception can be represented as “my perception.” A memory can be represented as “my memory.” A thought can be represented as “my thought.” These attributions are real biological and representational operations. They can organize behaviour, memory, attention, communication, and later processing. [72, 140–145, 195]

The distinction can be stated directly:

$$real\ representation\ of\ ownership \neq independently\ existing\ owner$$

The reality of the ownership representation does not establish an additional entity standing behind the process as its prior possessor.

This distinction becomes particularly clear with thought.

The apparent sequence is:

$$I \rightarrow authored\ the\ thought$$

But the architectural sequence is closer to:

$$biological\ and\ recursive\ processing \rightarrow thought \rightarrow attribution\ of\ thought\ to\ I$$

The first-person result is “I thought it.” Yet an authorship attribution cannot be the antecedent cause of content that must already have occurred before it can be attributed.

Within this architecture, the narrator is therefore not the primitive thinker from whom thought originates. Thought becomes organized within the living process and is subsequently indexed as “my thought.”

The experimental manipulation of thought authorship discussed in Section 14.2 reinforces this distinction. The attribution “this thought is mine” can be shifted toward an external source. The occurrence of thought and the attribution of its authorship are therefore separable operations. [195]

This is precisely what the first-person form tends to conceal.

The attributed product is available as “my thought.” The generative history of both the content and its authorship attribution is not presented in that same form.

Memory can reinforce the reversal.

A remembered event is represented through a present reconstruction from retained information under current biological conditions and then attributed to the established reference point: “I remember this happening to me.” The present biological reconstruction and the representation it generates are real, but the past event represented by that reconstruction is not thereby made physically present again. In this respect, remembered past and imagined future share the same architectural status: both are present biological representations of events that are not presently occurring, although a memory may refer to an event that actually occurred whereas an imagined future may never occur. [5–7, 9, 10, 96, 114, 115]

These attributed memory representations can subsequently function as evidence for the apparent continuity of the same owner. [5–7, 96]

The recursive structure can therefore become self-confirming.

Memory representations are indexed to “me,” and those same representations are then used to establish that the “me” to which they are indexed has persisted continuously through time. [5–7]

The biological reconstruction, retained information, present representation, and their present causal consequences are real. [9, 10, 96, 114, 115] What is not reinstated is the past event itself. Autobiographical continuity can therefore be biologically and representationally real without establishing an independently persisting psychological entity.

$$autobiographical\ continuity \neq independently\ persisting\ psychological\ entity$$

Action selection can be organized in the same way. Organisms compare alternatives, predict consequences, inhibit responses, and select actions. These are real organismic functions. Once the resulting selection is represented through the narrator-level reference, it can appear as the act of an independently existing chooser: [68, 98]

“I chose.”

The functional achievement is then attributed to an apparent inner controller.

Again, the attribution is not the error. A functioning organism requires ways of organizing perception, memory, action, and prediction relative to itself.

The error occurs when the functional reference carried by “I,” “me,” and “mine” is converted into evidence for an independently existing bearer standing prior to the activity being referenced.

Functional attribution is not ontological division.

This distinction also preserves causal efficacy.

The narrator-level organization is not causally inert merely because it is downstream of the processes from which it arose. Once present, a thought, memory, interpretation, or self-referential representation can become a new present internal condition. That condition can alter attention, physiological regulation, memory retrieval, valuation, deliberation, inhibition, behaviour, and the conditions under which subsequent organism-relative state-transitions occur. [9, 10, 68–71, 114–116]

The sequence can therefore be represented schematically as:

$$\textit{biological processing} \rightarrow \textit{narrator-level representation} \rightarrow \textit{altered subsequent biological processing}$$

This recurrence does not restore the narrator to the antecedent position.

A later state can causally influence what happens next without becoming the earlier cause of the event from which that state emerged.

The architecture is therefore recurrent in operation without being circular in origin.

This matters because the Category Error does not require denying memory, thought, action selection, or behavioural regulation. These are real organismic processes. The mistake is the additional step through which the reference point around which those functions are organized becomes represented as an independent entity that stood behind them all along.

Section 13.2 approached the same inversion through perception. There, the apparent observer was shown to arise within the living perceptual and recursive organization it later claims to inspect. The present argument adds the representational reason that this observer nevertheless appears prior.

The perceptual and cognitive products become available already indexed to the observer-reference.

Their generative history does not arrive in the same form.

> The resulting representation therefore does not say:
>
> "An organism-relative biological process has occurred, recursive organization has now indexed the result, and a virtual reference point is consequently available."
>
> It says:
>
> "I see."
>
> "I think."
>
> "I remember."
>
> "I choose."

The apparent subject therefore appears prior because the output arrives already organized around it.

The process that generates the apparent owner also generates the representation that the owner was already present.

This is the deeper reversal.

The system does not first encounter a neutral event and then independently discover an ontological subject who owns it. The event becomes recursively organized through an established first-person reference, and that attribution is then experienced as evidence that the reference preceded the event.

A real first-person representation can therefore exist without an independently existing first-person owner standing outside the processes generating that representation.

$$\textit{real first-person attribution} \neq \textit{independently existing first-person owner}$$

The same principle extends beyond observation and ownership. Evaluation can be represented as something performed by an evaluator. Regulation can be represented as something performed by a controller. Action selection can be represented as originating from an independent chooser.

In each case, a real organismic function can become organized around a virtual reference point and subsequently represented as though an independent entity stood apart from the function and performed it.

The detailed consequences of the evaluator-evaluated division belong to the next stage of the manuscript. The present point is only architectural: the attribution pattern generalizes.

> Observation does not require an observer standing outside the process.
>
> Evaluation does not require an evaluator standing outside the process.
>
> Organismic regulation does not require a controller standing outside the process.

The Category Error begins when these functional relations are converted into ontological divisions.

The apparent owner does not precede the organism's activity. It is the form in which that activity subsequently represents and appropriates itself.

Its ownership representations are real. Their causal consequences are real. The organismic functions attributed through them are real.

What is not established by any of those facts is an independently existing owner standing prior to the processes and possessing them from outside.

The system's self-description is therefore not the architecture that generated the self-description.

To project that downstream product backward and treat it as the original observer, thinker, owner, or controller is to mistake the representation for the order of its own production.

Once that inversion has been exposed, the next question becomes unavoidable: what, exactly, has the Category Error removed—and what remains fully intact?

That is the question to which the next subsection turns.

14.5 What the Category Error Does Not Eliminate

The preceding argument has removed the independently existing owner from the primitive position assigned to it by the traditional subject–experience formulation. That conclusion is strong, but its scope must be equally precise. Correcting the Category Error does not eliminate the scientific problem of consciousness. It changes the form of that problem by removing an explanatory demand directed toward an assumed owner and returning the remaining questions to the biological architecture that actually requires explanation.

The Category Error removes an unsupported entity from the explanatory demand. It does not remove an event from reality.

Phenomenology remains. The living organism remains. The bounded biological event remains. Cognition, memory, recognition, ownership representation, introspection, behavioural regulation, and report remain.

What disappears is the requirement that these processes be presented to, possessed by, or commanded by an independently existing narrator-level owner.

Primary phenomenology is therefore not denied or redescribed out of existence. It remains the organism-relative inside view targeted by the framework. The relevant bounded biological state-transition likewise remains the proposed biological unit to which that inside view is mapped. The conditions under which that event occurs, the organization required for it, and the proposed identity relation between the event and phenomenology remain empirical scientific questions.

Removing the primitive owner does not remove the organism to whom conditions matter biologically. The organism remains a bounded living system with a real physiological history, spatial position, vulnerability, sensory organization, and regulatory requirements. Organism-relative differentiation and valuation do not require a reflective narrator standing outside those processes and assigning significance to them.

What the Category Error removes is more specific: biology is no longer required to explain how phenomenology is delivered to an independently existing narrator-level recipient whose relevant functions have already been derived within the architecture.

Eliminating a malformed explanatory demand is not the same as eliminating the scientific phenomena that motivated explanation in the first place.

The apparent subject is also no longer an unexplained remainder in the sense assumed by earlier formulations of the problem. The preceding architecture has already located narrator-level recognition and ownership downstream, derived the virtual reference point through recursive organism-relative organization, preserved its later causal efficacy, and shown that properties attributed to a unitary self can be biologically dissociated and manipulated. [20, 72, 90, 91, 103, 104, 136, 137, 140–149, 191–199]

That derivation need not be repeated here. Its consequence is enough: the narrator belongs inside the explanation rather than standing outside it as the entity for whom the explanation must ultimately be delivered.

The same precision applies to the downstream functions ordinarily attributed to that narrator.

Access and recognition are real biological operations. Memory retention and reconstruction are real biological operations. Introspection is real. Ownership representation is real. Deliberation, inhibition, planning, prediction, action selection, behaviour, and report are materially implemented and causally consequential. [5–10, 68, 69, 72, 96, 97, 102, 107, 148, 149, 191–195]

Their downstream status does not make them unreal.

What has been rejected is the additional inference that these functions require a separate owner standing behind them.

A biological representation can organize an event as "mine" without requiring an ontologically separate entity to possess it. Likewise, removing an inner controller does not remove the organism's capacity to compare alternatives, inhibit responses, revise plans, regulate behaviour, and act. Those functions do not require an additional controller standing behind the biological processes that perform them. [20, 68, 72, 98, 140–148, 195]

Removing the inner witness does not remove introspection either. It relocates introspection within the organism as recursive biological processing rather than treating it as inspection performed from outside the process. [107, 149]

Report remains scientifically important because it allows aspects of an event to become communicable and experimentally accessible. But report is evidence concerning phenomenology, not the criterion by which phenomenology comes into existence. [30, 31, 62, 73, 186, 191–194]

For that reason:

$$behavioural\ responsiveness \neq primary\ phenomenology$$

Failure of behavioural report alone cannot establish that primary phenomenology was absent when the proposed biological organization supporting the primary event may remain intact. Loss of language, memory access, motor output, or task-specific reporting capacity can interrupt the route to report without establishing absence of the primary event. [31, 73, 160, 161, 186]

Conversely, sufficiently abolishing the biological organization proposed to constitute the primary organism-relative event would be a different empirical condition. Failure of a downstream indicator therefore cannot automatically be substituted for failure of the primary event itself.

Memory provides another useful boundary.

A remembered event is a present reconstruction from retained biological information and current processing, not the original event replayed as though the past had become physically present again. [5–10, 96, 114, 115]

$$memory\ of\ an\ event \neq the\ original\ event$$

Retention and reconstruction are real biological processes with real effects on subsequent cognition, physiology, behaviour, and later organism-relative state-transitions. The resulting memory representation is real as a present representation, but the represented past event is not thereby physically reinstated. The reconstruction should not be substituted for the event it represents. [9, 10, 96, 114, 115]

The same discipline must be applied to the two major scientific achievements now being distinguished.

The Category Error argument and the organism-relative identity proposition do different work.

The Category Error concerns the architecture of the apparent subject. The defined narrator-level owner has been physically constrained to a downstream position, empirically decomposed into alterable biological processes, and shown to acquire apparent priority through first-person representation. [20, 72, 90, 91, 103, 104, 136, 137, 140–149, 191–199] The convergent evidence therefore establishes the temporal and architectural constraints under which assigning that downstream owner the primitive position of antecedent experiencer constitutes the Category Error defined here.

The identity proposition addresses a different question: what is the relation between the complete bounded organism-relative biological event and primary phenomenology?

These two claims should not be collapsed.

$$Category\ Error\ validation \neq identity\text{-}relation\ validation$$

Demonstrating the Category Error does not automatically prove the complete organism-relative identity proposition. But neither does the separate empirical burden carried by the identity proposition weaken the Category Error. Distinct scientific claims require distinct evidential support.

The Category Error is established at the point at which the narrator-level owner has been excluded from the primitive position in which the malformed question places it.

The Mapping Theorem performs the different task of constraining the biological identity relation at the corrected target.

Its primary target is therefore not narrator-level ownership, autobiographical interpretation, or report. The Mapping Theorem takes up the relation between the relevant bounded organism-relative biological organization and primary phenomenology itself. Correcting the Category Error prevents the mapping from being directed toward the wrong architectural level; the theorem then tests the biological relation on its own terms.

This division of labour is important because the scientific problem has not disappeared. It has become more precisely located.

The remaining empirical work includes continued specification and testing of the complete bounded organism-relative event, stronger causal constraints on the proposed identity relation, explicit perturbation and restoration conditions, and further refinement of downstream mechanisms where necessary. These are not residual mysteries produced by failure of the Category Error argument. They are the genuine scientific questions that become visible once the malformed recipient has been removed.

The distinction also separates the present framework from a merely eliminative appeal to illusion.

Simply declaring “the self is an illusion” would be insufficient if the biological architecture generating self-related representation remained unexplained. Likewise, declaring experience itself illusory would not solve the present problem; it would remove the phenomenon the framework is attempting to explain.

The present claim is different.

The illusion is not phenomenology. The illusion is the inferred ontological division through which real biological and representational activity is presented as the possession or activity of an independently existing owner.

The ownership representation is real as a representation. The processes producing it are real. Its biological consequences are real. What remains unsupported is the independent owner inferred from that representation. [20, 72, 140–145, 195]

Correcting the Category Error therefore requires decomposition, not denial.

A scientifically adequate account must identify what is physically and phenomenologically present within the organism and what is misrepresented about the organization of those processes. It must explain why ownership occurs, why first-person reference occurs, why the narrator appears continuous, and why those representations can alter later behaviour and physiology. What it need not add is a second entity standing apart from those processes and receiving their products.

The correction is therefore subtractive only with respect to the unsupported ontological division. Scientifically, it is clarifying: each real process is returned to the architectural level at which it can actually be investigated.

Phenomenology remains the primary explanatory target. The bounded organism-relative event remains the proposed mapped biological unit. Access, recognition, memory, introspection, ownership, behavioural regulation, and report remain real downstream biological achievements. The narrator remains a materially implemented and causally consequential virtual reference point.

What no longer occupies the starting position is an independently existing recipient to whom all of these processes must somehow be delivered.

The Category Error therefore does not dissolve the need for explanation. It prevents explanation from being directed toward an entity that the architecture has already shown to be downstream.

The remaining structural question can now be stated more broadly.

Once every retained phenomenon, function, and relation has been assigned its architectural position, does any explanatory residue remain at all?

The Category Error has removed no necessary biological or phenomenological function. It has removed only the independently existing recipient to whom those functions were mistakenly attributed.

If no residual entity, function, relation, or additional explanatory bridge remains necessary, the architecture has reached the condition examined in the final subsection: structural closure.

14.6 Structural Closure

The preceding subsections have removed no necessary biological or phenomenological function from the account. Primary phenomenology remains. The complete bounded organism-relative biological event remains. Cognition, memory, recognition, ownership representation, introspection, behavioural regulation, and report remain materially implemented and causally consequential. The apparent narrator has likewise been retained as a physically implemented recursive organization whose independent referent is virtual.

The question at this point is therefore no longer whether one particular observer has been excluded from one particular position. The question is whether anything required by the explanatory architecture remains unaccounted for.

Structural closure is reached, within a defined explanatory architecture, when every term required by the explanandum has been assigned an explicit status, the relations among those terms have been specified, and no residual entity, function, relation, or additional explanatory bridge remains necessary to complete the account.

Closure in this sense does not mean that every empirical parameter has already been measured, every biological mechanism has been quantified, or every proposed identity relation has been exhaustively validated. It means that the architecture itself contains no unexplained remainder to which some further kind of explanatory work must still be assigned.

The distinction is essential:

$$\textit{structural closure} \neq \textit{completion of every empirical measurement}$$

Structural closure concerns explanatory completeness at the architectural level. Empirical validation concerns whether the relations occupying that architecture are in fact correct. A proposed architecture can therefore be structurally closed while its empirical claims remain open to refinement, stronger constraint, or falsification.

Section 10 already established the self-side of this result. The narrator was derived as a materially implemented, temporally downstream, recursively generated virtual reference point rather than retained as an unexplained thinker, witness, owner, or controller. The present subsection does not repeat that derivation. It asks whether, once that result is combined with the deconflation completed in Sections 14.1-14.5, any explanatory residue remains in the inherited subject-experience problem.

The corrected architecture can be stated compactly:

$$\textit{complete bounded organism-relative biological event} \leftrightarrow \textit{primary phenomenology}$$

followed by downstream biological operations through which aspects of the event become accessible, recognized, reconstructed, attributed, owned, and reported.

The bidirectional sign here marks the proposed identity target developed elsewhere in the manuscript. It is not introduced as a proof of that identity. Its role in the present subsection is only to locate the primary explanatory relation before the later architecture of recognition, ownership, and report is added.

Once the levels are assigned in this way, the original subject-experience formulation can be audited for remainder.

Is phenomenology still unexplained because it must be presented to an additional recipient? No additional recipient is required by the architecture. Phenomenology is the primary organism-relative inside-view target. Narrator-level ownership is a later organization through which the event becomes represented as occurring to "me."

Is an observer still required to stand outside the process and witness what occurs? No. Perceptual and introspective operations are themselves part of the organism's biological and recursive organization. The observer-reference is generated within that organization rather than added as an independent witnessing term. [107, 149]

Is ownership still left unexplained unless a separate owner is posited? No. Ownership has already been assigned a biological and representational role: content becomes organized as "mine" through downstream recursive attribution. [72, 140–145, 195]

$$physical\ recursive\ implementation \neq independently\ existing\ represented\ owner$$

The reality of the ownership representation therefore does not leave an additional owner waiting to be explained behind it.

Is thought left without an origin unless an independent thinker is added? No. Thought generation belongs to the organism's biological and recursive activity. A later attribution such as "my thought" organizes the result around the virtual reference point; it does not create an additional antecedent thinker required to initiate the process.

Is biological regulation incomplete unless an inner controller is added? No. Comparison, inhibition, prediction, action selection, physiological regulation, and behavioural adjustment are already operations of the living system. A represented controller adds no further causal role. [68, 98]

$$organismic\ regulation \neq independent\ internal\ controller$$

Is report left unexplained unless phenomenology is first translated for a private witness? No. Access, recognition, memory, reconstruction, selection, motor organization, language where applicable, and report already constitute the relevant downstream biological operations. A separate recipient does not perform an additional translation function. [30, 31, 62, 73, 186, 191–194]

The same test can be applied to the explanatory gap itself. Once primary phenomenology has been separated from access, recognition, ownership, reconstruction, introspection, and report, no second bridge is required merely to carry phenomenology to an independent narrator. The destination of that supposed bridge has been returned to the downstream architecture that generates it.

The apparent explanatory remainder is therefore not an independently established entity awaiting further connection. It is the later narrator-level reference point projected backward into the primary relation and then treated as though its possession of phenomenology were an additional fact still requiring explanation.

The final Category Error can now be stated in its most compressed form.

A recursively generated, temporally downstream reference point is assigned the primitive category of experiencer, and biology is then asked to explain how phenomenology arises for the very owner that the same architecture subsequently generates.

The error is not merely that the owner occupies the wrong temporal position. The deeper structural error is that a derived explanatory term is reintroduced as though it were an independent remainder outside the explanation.

Once the narrator-level reference point has been physically constrained to a downstream position, recursively derived, empirically decomposed, and conceptually separated from primary phenomenology, reinstalling it as the primitive bearer of phenomenology does not reveal a new problem. It simply recreates the explanatory residue that the architecture has already dissolved. [20, 72, 90, 91, 103, 104, 136, 137, 140–149, 191–199]

The closure criterion is therefore broader than the absence of an external observer. The observer, owner, witness, thinker, controller, and private recipient are candidate residues. Structural closure is reached only when the audit shows that none of them performs an unexplained function and that no other residual term, relation, or bridge remains necessary.

This can be expressed schematically as:

$$accounted\ explanatory\ terms + specified\ relations + no\ residual\ role + no\ additional\ bridge \rightarrow structural\ closure$$

The schematic is not a quantitative proof. It states the logical condition being applied to the architecture.

On that criterion, the subject-side architecture closes. The biological event has a defined primary phenomenological target. The later organization of access, recognition, memory, reconstruction, ownership, introspection, and report has defined downstream roles. The apparent subject has been derived rather than assumed. Its apparent priority has been explained. Its ownership relation has been decomposed. No additional entity remains necessary to receive, witness, possess, translate, or control what the organism's own processes already account for.

The result is not that an observer has merely failed to appear. The result is that no explanatory work remains unassigned to such an observer.

The same applies to the independent owner and controller. Their removal does not create vacancies in the architecture because the functions attributed to them have already been located within the organism's actual organization.

Within the subject-experience problem defined here, there is therefore no residual term left requiring a second explanatory level beyond the biological event, primary phenomenology, and the downstream processes through which that event becomes recognized, reconstructed, owned, and reported.

Structural closure does not end scientific investigation. It fixes the explanatory architecture against which further empirical work is conducted. The Mapping Theorem bears the separate burden of specifying and testing the proposed identity relation between the complete bounded organism-relative event and primary phenomenology. Further biological refinement can strengthen, weaken, or falsify particular claims within that mapping without reopening an architectural role for an independently existing narrator-level recipient.

The division of labour can therefore be stated precisely:

$$structural\ closure \rightarrow no\ explanatory\ residue\ within\ the\ architecture$$

$$Mapping\ Theorem \rightarrow empirical\ constraint\ of\ the\ proposed\ biological\ identity\ relation$$

One does not substitute for the other. Structural closure prevents the explanatory problem from regenerating an unnecessary subject-side remainder. The Mapping Theorem tests whether the proposed primary biological-phenomenological relation occupying that closed architecture is scientifically correct.

Phenomenology also remains organism-relative after closure. The event occurs within and relative to a particular living organism with its own boundaries, history, present condition, sensory organization, and regulatory requirements. Nothing in structural closure converts that perspective into a view from nowhere.

What closure removes is the additional claim that organism-relative phenomenology must be presented to a separate narrator in order to become subjective.

A biological perspective does not require a spectator standing behind that perspective.

The structural result therefore goes beyond the statement that the self is merely "illusory." The implementing processes have been retained; their temporal and causal positions have been constrained; their representational products have been distinguished from their referents; and the functions previously attributed to an independent owner have been returned to the biological and recursive organization that performs them.

Reintroducing the owner adds no explanatory content.

Any proposal to restore an independent primitive experiencer must therefore identify what that experiencer is, operationalize its biological or causal status, locate it within the causal-temporal architecture, demonstrate that it occupies the antecedent position required of a primitive experiencer rather than the downstream position of the derived narrator, and identify explanatory work that remains for it to perform.

The architecture now permits one further generalization. The same reference-point organization through which perception is represented as occurring to an observer can organize valuation as though it were performed by an evaluator and regulation as though it were exercised by a controller. In each case, an organismic process can be represented as standing in relation to an apparent centre that is then experienced as separate from the process itself.

> The observer appears divided from the observed.
>
> The evaluator appears divided from the evaluated.
>
> The controller appears divided from the controlled.

The next section examines what follows when that represented division is recursively sustained through thought operating as psychological time.

15.0 Insight: Thought, Psychological Time, and the False Division

15.1 Psychological Suffering as a False Division

This category error is not merely abstract. It manifests concretely in the generation of psychological suffering, as the virtual narrator creates a false division between "self" and world through the movement of psychological time.

When an external stimulus occurs—for example, an unfamiliar noise—the sequence of psychological time unfolds as follows. Thought arises: "What is that? Is it a danger to me? I am experiencing fear. I have something to be afraid of."

Thought, operating as psychological time, creates a false division between the organism and a "self" that is experiencing fear. The conditioned self perceives the noise as the cause of fear. But no such separation actually exists. The fear evaluation is generated entirely within the organism's own biological architecture through the recursive narrator and thought operating as psychological time. [56, 57, 101]

The external stimulus is merely the trigger. It has no intrinsic value in itself. Value is assigned within the organism through thought operating as psychological time. Thought generates both the fear and the apparent self who claims to experience, judge, resist, or escape it. The evaluator is the evaluated.

Stated another way, thought creates the virtual reference point and organizes the evaluation of the event around it. It then divides the apparent evaluator from both the process that generated it and the state it is evaluating. The value generated through the organism's relation to the event appears to belong to the event itself, while the virtual reference point appears as the independent self confronting it. The resulting conflict therefore appears to occur between two separate realities even though both the apparent evaluator and the psychological significance it confronts arise within the same conditioned movement. The apparent controller is another expression of the process it is attempting to control.

When the illusory separation between the organism authoring fear and the self experiencing fear is perceived as illusory, the division dissolves—the recursive self-audit ceases, and fear dissolves along with it, instantly and effortlessly. The movement of thought that authors this division also generates the internal stimulus to which the recursive audit responds, thereby producing psychological suffering. Inner conflict does not come from the world. It arises from the self's recursive reaction to the world through psychological time.

This is why one individual may experience intense fear in response to a particular stimulus while another remains completely unaffected by the same stimulus. [22–24, 56, 57, 100, 101]

15.2 Purpose, Scope, and Scientific Status

Insight is commonly described as the acquisition of a new understanding, the sudden recognition of a previously unnoticed relation, or the emergence of knowledge that alters subsequent thought and behaviour. Such descriptions mark an important phenomenological distinction, but they do not identify what changes within the biological organization of cognition. They also tend to group together processes that may be structurally different: the acquisition of information, reasoned inference, effortful concentration, temporary cessation of thought, and a reorganization in which a previously governing interpretation can no longer coherently organize present experience. [200]

The present section develops a more constrained account. Insight is examined as a candidate form of recursive reorganization in which a governing organization loses viability when the relation on which it depends becomes directly evident. Insight is therefore not defined by the amount of information acquired, the emotional intensity of the event, or the speed with which it occurs. Its defining feature is a change in governing viability: an organization that previously structured perception, interpretation, ownership, evaluation, and response can no longer operate with the same unquestioned authority once its causal organization has been directly exposed.

This proposal requires a precise distinction between thought and perception. Thought is treated here as the present movement of accumulated knowledge and memory through psychological time. Experience, learning, conditioning, language, retained biological history, and prior cognitive organization shape the conditions from which subsequent thought arises. Thought reconstructs what has passed, compares retained content with present conditions, and projects possible future states. Even apparently novel thought remains dependent upon accumulated organization, although it may recombine, abstract, reinterpret, or project that organization in forms not previously expressed. [5–10, 96–100]

Perception, by contrast, is treated as present organism-relative registration. It may be rapidly named, compared, interpreted, or incorporated into memory, but it is not thereby reducible to those subsequent memory-dependent operations. This distinction is indispensable to the proposed account of Insight. If all present registration were only the rearrangement of retained thought, cognition could modify its existing content but could not explain how the governing organization itself becomes directly evident as untenable. Direct perception is not described here as an act performed by a psychologically separate perceiver. The relation becomes evident without an independent observer standing outside the movement being exposed. [29, 71, 96, 99, 106, 136, 137, 191–194]

The resulting transformation is characterized primarily by constraint through negation. The previous organization need not be erased. It may remain available as memory, historical knowledge, conceptual understanding, or an intentionally reproduced representation. What changes is its authority. The prior interpretation may still be remembered while no longer remaining viable as the unquestioned structure through which present experience is organized. Insight therefore concerns a loss of governing viability rather than the simple replacement of one proposition by another.

The section applies this general mechanism to two related but distinct targets. The first is the self-generating movement of thought. Across psychological development, memory, language, ownership, comparison, evaluation, reconstructed past, projected future, fear, desire, and repeated indexing progressively author a virtual reference point. Once established, this reference point is continually recruited, updated, and maintained through ongoing cognition. It appears as the thinker, observer, evaluator, controller, chooser, owner, and potential sufferer. The self is therefore not newly created in full by each individual thought; it is historically accumulated and recursively maintained. [5–10, 68, 69, 72, 96–100, 147, 195]

When this generating movement becomes directly evident, the virtual self can no longer be coherently interpreted as the independent author of thought. The causal relation is reversed: the self does not author thought; thought authors and maintains the self. Thought supplies the apparent observer, the observed content, the problem, the value assigned to the problem, and the imagined future resolution. There is no genuinely independent psychological subject standing outside the movement. The observer is thought represented as an observer, and what it observes is another formation of thought: one process recursively encountering its own products while mistaking an internal division for a relation between two independent realities.

A second accessible formulation makes the same constraint explicit: the self is thought as memory. Subtract thought as memory, and what remains of the psychological self? This question is not offered as a verbal proof or a formula whose repetition produces Insight. It identifies the relation to be examined. If apparent continuity, ownership, and authorship depend upon the present operation of accumulated memory as thought, then the absence of that movement removes the basis on which an independently existing psychological self is ordinarily inferred. The subsequent subsections develop this relation without denying the continuing reality of the organism, its biological history, its phenomenology, or its practical capacity for self-reference.

The second target is the conditioned continuity of cognition. Insight into the self-generating movement does not imply that thought as a biological capacity disappears. Thought may continue through memory activation, association, comparison, prediction, simulation, language, planning, communication, and practical problem-solving after the self is no longer interpreted as an independent controller. A further question therefore arises: why does cognition repeatedly reactivate and continue when no independently present practical, organismic, or environmental requirement remains unresolved? [68, 96–99, 102, 201]

The candidate architecture developed in this section begins from the absence of a neutral computational standpoint. Whenever cognitive thought operates through psychological time, its recruitment is necessarily evaluative. External conditions, bodily states, memories, and internally generated representations are encountered through accumulated conditioning and present biological organization. This differential organization can produce a biological state transition and recruit memory, comparison, imagery, language, prediction, projection, simulation, planning, action, or further representation. Cognitive thought thereby arises through conditioned evaluative recruitment rather than through the decision of an independently existing thinker. [22–24, 56, 57, 100, 101]

Thought does not exist merely to produce another thought. It may guide practical action, contribute to resolution, modify biological state, terminate, or become further cognitive input. Once generated, however, thought can itself become a present stimulus. A remembered past or projected future is not presently occurring as the represented event, yet its representation occurs now and may produce a present biological transition. The altered state and representational content then become new conditions for evaluation. In this way, the organization can continually generate fresh internal material without requiring a new external event. [9, 10, 114–116]

Persistent unnecessary cognition is therefore treated not as the choice of a separate thinker but as a natural consequence of recurrent evaluative organization. The established virtual reference point is recruited, updated, and attributed authorship of operations that historically produced and presently maintain it. The process thereby conceals its own causal order. Internally generated representations may appear as independent psychological problems requiring further evaluation by an independent subject, even though the apparent observer, problem, assigned value, biological response, and projected resolution are formations within one conditioned movement. [12, 13, 21, 117, 119, 201]

Insight into this second target concerns the conditioned organization through which cognitive content repeatedly acquires recursive continuation when no practical requirement remains. Direct perception does not perform an evaluation that unnecessary thought should stop. Nor does an internal monitor decide which thoughts deserve continuation. The organization through which internally generated content acquired psychological necessity loses viability, and unnecessary thought subsequently fails to gain the same recursive continuation. Thought may still arise, and practical cognition remains fully available, but an arising representation need not automatically become a problem requiring another thought.

These two applications should not be interpreted as different levels or grades of Insight. The proposed mechanism remains constant: a governing organization loses viability when its causal relation becomes directly evident. What differs is the target and scope of the resulting constraint. Insight into the self-generating movement concerns cognition organized around the virtual reference point. Insight into the conditioned continuity of cognition concerns the evaluative recruitment through which thought becomes its own stimulus and is unnecessarily reinstated or prolonged.

Complete attention must be distinguished from both forms of reorganization. When attention is complete, thought operating through psychological time is absent while present organism-relative phenomenology remains. Memory-dependent reconstruction, narration, comparison, projection, and psychological becoming do not occupy the interval, and no active thought is present to propagate another. In this specific sense, the interval is silent. Silence does not imply unconsciousness, diminished phenomenology, biological inactivity, sensory deprivation, or cognitive incapacity. It refers only to the absence of active thought operating through psychological time.

This distinction permits a structural definition of meditation. Complete attention demonstrates that active thought can cease while organism-relative phenomenology and biological responsiveness remain. The resulting silence, rather than the method intended to induce it, constitutes meditation in the sense developed here. Repetition, concentration, controlled breathing, posture, or other practices may alter the conditions under which thought becomes quieter, but a method is not identical to the absence of psychological time. [36, 37, 43, 59, 149]

A temporary silent interval does not establish durable reorganization. When attention loosens, prior pathways may remain available and cognition may resume. Choiceless awareness is proposed as the consequence of a more stable alteration in the recruitment conditions of unnecessary psychological time. It is not attention imposed or maintained by an independently acting chooser. The apparent chooser is itself generated within thought and cannot stand outside that process to determine when thought should begin or end. Thought remains biologically available and may be recruited by practical demand, while unnecessary cognition need not continuously manufacture further demand from its own products.

The account developed in this section is theoretical. It draws upon the preceding architecture of psychological time, recursive organization, the virtual reference point, the Stochastic Pump, and Friction Signatures, but the complete biological mechanism of Insight has not yet been empirically established. The section therefore distinguishes architectural derivation, phenomenological observation, candidate biological implementation, adjacent empirical evidence, and testable prediction. It does not claim that all Insight is instantaneous, that one perceptual event necessarily produces complete or permanent reorganization, that previously conditioned pathways are erased, or that all organisms must encounter the relevant architecture through identical content.

The scientific value of the account depends upon whether its distinctions can be operationalized. Knowledge acquisition, conceptual acceptance, complete attention, Insight into the self-generating movement, Insight into conditioned cognitive continuity, meditative absorption, and global suppression of cognition should not produce identical biological trajectories. If the proposed architecture is correct, these conditions should differ in the recurrence and authority of the prior organization, the probability that one thought recruits another, the effort required to regulate cognition, the preservation of practical cognitive capacity, the duration and organization of the corresponding Friction Signature, and the stability of change across time and context.

The purpose of Section 15 is therefore not to append a contemplative interpretation to the framework. It is to determine whether Insight can be described as a biologically grounded reorganization of recursive cognition; to identify the organization through which thought, psychological time, and the virtual reference point arise; to distinguish state-level silence from durable alteration of governing organization; to explain why knowledge, will, resistance, and method do not necessarily reorganize the structure; and to derive consequences that can, in principle, be measured and falsified.

15.3 Thought, Psychological Time, and the Virtual Reference Point

The proposed architecture of insight depends upon a prior distinction between thought as a biological capacity and the virtual self that thought subsequently generates. If this causal order is reversed, insight is readily misdescribed as an act performed by an independently existing thinker: the self observes its own activity, recognizes an error, and then chooses to reorganize thought. That interpretation would reintroduce as a causal primitive the very entity that the framework has already derived as a product of recursive processing.

The present account begins from the opposite direction. Thought does not require an independently existing thinker in order to occur. Memory can be activated, alternatives compared, consequences projected, language generated, and action prepared before those operations are retrospectively attributed to an apparent owner. The thinker is therefore not treated as the biological source of thought. It is treated as a virtual reference point generated through the organism-relative organization of thought itself. [68, 96–99, 102, 136, 137, 149, 195–199, 201]

Thought is defined here as the present movement of accumulated knowledge and memory. That accumulation includes the retained consequences of experience, learning, conditioning, language, social interaction, affective history, prior evaluation, and previous cognitive activity. What is ordinarily called the past does not return as the original event; it is reconstructed in the present through the organism's retained biological organization. Likewise, the future does not yet exist as an encountered event. It is projected in the present through memory, comparison, expectation, and simulation. [5–10, 96–102]

Psychological time refers to this active movement of retained past into present processing and its projection toward possible future states. It should not be confused with chronological time as measured by clocks, nor with the physical succession required for biological processes to occur. Psychological time is a present biological operation: accumulated experience is reconstructed, compared with current conditions, evaluated relative to the organism, and extended toward anticipated outcomes. [9, 10, 96–99]

> *Experience and organism-relative evaluation → retained knowledge and memory → present activation → reconstruction, comparison, or projection → further organism-relative evaluation → action, narration, or recursive continuation*

Thought necessarily operates from a historically conditioned standpoint. Every memory retrieved, possibility imagined, word selected, and consequence evaluated depends upon the organization already available to the organism. Even thought that appears novel is generated through the recombination, abstraction, reinterpretation, or projection of retained organization. It may produce a configuration that has never previously occurred, but the materials and relations through which that configuration is generated remain dependent upon accumulated biological history. [96–100, 201]

This dependence does not make thought merely repetitive. Recombination can generate new hypotheses, designs, explanations, plans, and possible actions. A woodworker can imagine a table that has never existed, a scientist can formulate a model not previously expressed, and an organism can simulate a response it has never enacted. In each case, however, novelty is assembled through retained knowledge, present conditions, organism-relative valuation, and the capacity to compare and project. Thought can reorganize existing content into a new configuration without becoming independent of memory. [98, 99]

The organism-relative character of this process is essential. A living system does not evaluate information from a neutral computational standpoint. Present conditions are registered relative to the organism's maintained state, vulnerabilities, capacities, retained history, and available responses. The same external event can therefore recruit different memories, expectations, valuations, and actions in different organisms, or in the same organism under different physiological and contextual conditions. [22–24, 56, 57, 100, 101]

The recursive audit describes the continuing process through which retained and newly generated content re-enters subsequent organism-relative processing. A present event activates memory; the activated memory alters the organism's present condition; and the altered condition affects what is subsequently noticed, retrieved, valued, projected, or prepared for action. The result of one cycle therefore becomes part of the conditions governing the next. [12, 13, 21, 22, 114–116]

This recursion has substantial adaptive value. A living organism must retain the consequences of previous encounters, anticipate possible outcomes, compare current conditions with prior states, and alter behaviour accordingly. Without such continuity, each event would be encountered without the benefit of learning. The organism would be unable to prepare for danger, coordinate extended action, maintain social relationships, solve practical problems, or preserve behavioural organization across changing circumstances. Thought, memory, comparison, expectation, and projection are therefore not treated as errors. The difficulty arises from a structural consequence of their recurrent organism-relative organization. [5–10, 68, 96–102]

Because evaluation repeatedly occurs relative to the same living system, recursive processing requires a functional point of reference. Events are indexed according to the organism's bodily condition, retained relationships, goals, injuries, abilities, and anticipated consequences. Across successive cycles, this indexing produces a dynamically updated reference point around which experience is organized. An event is remembered as having happened to me; a possible future is projected as something that may happen to me; an action is represented as something I will perform; and an injury, achievement, or thought becomes my injury, my achievement, or my thought. [5–7, 69, 147]

This reference point need not be deliberately constructed. It emerges through the repeated organization of biological content relative to the same organism and its accumulated history. Because it is continuously regenerated, it appears continuous. Because it appears continuous, it is readily interpreted as an enduring entity rather than as an ongoing biological construction. The resulting virtual reference point is experienced as the thinker, narrator, observer, evaluator, chooser, controller, and owner of experience. These functions need not arise simultaneously or with equal strength; their apparent unity results from their repeated organization around the same reconstructed centre. [5–7, 20, 69, 72, 147, 195]

Accumulated knowledge and memory → thought operating through psychological time → recursive organism-relative evaluation → continuously updated virtual reference point → apparent thinker, observer, evaluator, controller, and owner

This sequence reverses the ordinary interpretation of cognition. The apparent thinker does not stand prior to thought and direct its production. Thought generates a virtual reference point and subsequently attributes its own activity to that reference point. In accessible terms, the self does not author thought; thought authors the self. A related phenomenological prompt expresses the same constraint: the self is thought as memory. Subtract thought as memory, and what is left of the self? Neither formulation substitutes for the derivation. Both make the causal reversal directly accessible and identify the relation to be examined.

The claim does not imply that generated self-reference is causally inert. Once produced, it becomes part of the organism's retained and present organization. A thought attributed to 'me' can alter autonomic state, recruit autobiographical memory, intensify threat or reward valuation, redirect attention, and stimulate further cognition. The virtual reference point can therefore become causally involved in later processing without becoming an independently existing entity. A downstream construct can participate in the process that continues to generate it. [12, 13, 16, 21, 69, 114–116, 119]

Thought → organism-relative self-reference → evaluation of consequence for "me" → altered biological state → further memory, comparison, or projection → renewed thought

Causal efficacy does not establish ontological independence. A representation of a future threat can alter heart rate and behaviour even though the represented future does not yet exist. In the same way, a virtual self can influence subsequent biological processing without existing as a separate thinker outside that processing. [13, 114, 115]

This distinction is central to the architecture of insight. If the self were the original author of thought, it could be imagined as standing apart from thought, examining it neutrally, and choosing whether it should continue. The familiar instruction to stop thinking would then appear biologically straightforward: the thinker would simply withdraw authorization from its own thoughts. Ordinary experience does not support this causal picture. Thoughts arise without deliberate initiation, memories appear

unexpectedly, attention wanders despite an intention to concentrate, and associations recruit further associations. A person may recognize that rumination is unnecessary while remaining unable to terminate it through command. [12, 13, 21, 149, 201, 202]

These observations follow naturally if the apparent controller is generated within the process it attempts to control. Its inability to stop thought is not evidence of weak will; it is a consequence of causal order. The product cannot stand outside the process that continually produces it and act as that process's independent source.

This conclusion does not imply that attention cannot be directed, actions inhibited, plans followed, or cognition regulated. Those capacities are real biological operations. The framework rejects only the additional claim that they are performed by an ontologically independent inner agent. Selection, inhibition, correction, persistence, and behavioural control remain functions of the organism's distributed biological organization. [68, 116]

Thought must also be distinguished according to the conditions under which it is recruited and terminated. Practical cognition draws upon accumulated knowledge and psychological time in response to an actual unresolved requirement. A measurement must be recalled, an object located, a danger assessed, a sentence formulated, or a future action coordinated. Thought is recruited because the present situation requires reconstruction, comparison, simulation, or projection. [68, 97–99, 102]

Actual problem, discrepancy, or organismic requirement → cognition recruited → memory, comparison, simulation, or planning → action or resolution → cognition terminates

The use of memory and projection does not by itself make thought psychologically dysfunctional. A craftsperson planning the next cut, a driver anticipating traffic, or a person remembering an appointment is operating through retained knowledge and projected consequence. The decisive feature is that cognition remains coupled to an actual requirement and can terminate when that requirement has been resolved.

Unnecessarily continuous cognition follows a different trajectory. Internally generated content becomes a new stimulus even when no present practical or organismic demand remains unresolved. A thought activates a memory, comparison, possibility, discrepancy, or unfinished narrative; that product then acquires sufficient relevance to recruit another thought. Cognition continues not because the environment or organism presently requires resolution, but because the output of thought has itself become the condition for further recruitment. [12, 13, 21, 117, 119, 201]

Internally generated content → organism-relative relevance → memory, comparison, or projection → new internally generated content → renewed relevance → continued cognition

This movement may include explicit self-reference, but it need not. Cognition can continue through association, verbal rehearsal, imagined dialogue, problem simulation, or spontaneous recombination without repeatedly invoking the word 'I.' The primitive continuity of cognition is therefore not reducible to the narrator, although the narrator can substantially intensify and prolong it. [201]

This distinction prevents two errors. First, direct perception of the virtual self should not be expected to abolish thought as a biological capacity. Thought precedes and generates the self; memory, comparison, language, and practical projection can therefore remain available after the apparent thinker is no longer interpreted as an independent controller. Second, preservation of thought does not require cognition to remain continuously active. Thought may remain fully available as a biological instrument while no longer operating as the organism's compulsory default occupation.

The Insight architecture therefore addresses two targets through the same general mechanism. The first is the self-generating movement through which thought produces and continually sustains the virtual reference point. The second is the conditioned recruitment through which internally generated content perpetuates cognition in the absence of an actual unresolved demand. These are not levels or grades of insight. The proposed mechanism remains direct perception rendering a previous recursive organization nonviable; what changes is the organization brought into perception and, consequently, the scope of reorganization.

Before that mechanism can be examined, a further distinction is required. Thought operates from retained knowledge and memory, whereas insight is proposed to involve direct perception of a relation that the prevailing organization can no longer coherently contain. The next subsection therefore distinguishes thought from perception, direct perception, and complete attention, and examines how present perception can reorganize a memory-dependent cognitive structure rather than merely add further content to it.

15.4 Thought, Perception, Direct Perception, and Attention

The proposed architecture of Insight depends upon distinctions that ordinary language often obscures. Thought, perception, direct perception, introspection, attention, and conceptual understanding are frequently treated as interchangeable descriptions of a single cognitive activity. Within the present framework, however, they perform different functions. If direct perception is reduced to another movement of thought, Insight becomes indistinguishable from acquiring a belief, reaching a conclusion, or adding information to memory. The proposed mechanism of recursive reorganization would then disappear, because the prevailing organization would merely receive additional content rather than lose viability through what becomes directly evident.

Thought is memory-dependent representational activity. It is the present activation and reorganization of accumulated knowledge, conditioning, language, prior evaluation, and retained biological history through psychological time. Thought retrieves and recognizes, reconstructs and interprets, compares and abstracts, names and symbolizes, evaluates and narrates, and projects possible future states. These operations may occur verbally, visually, affectively, spatially, or through combinations of several

forms. An internal sentence, an imagined scene, a remembered injury, and a practical plan differ phenomenologically, but each depends upon retained organization becoming active in the present. [5–10, 96–100]

Thought is therefore never independent of the organism's past. Even apparently novel cognition arises through recombination, abstraction, reinterpretation, or projection of accumulated organization. A design, explanation, hypothesis, or imagined possibility may never previously have occurred in precisely the same form, yet the materials and relations through which it is generated remain historically conditioned. This dependence does not deny novelty; it specifies the biological organization through which novelty becomes possible. [96–100, 201]

The represented past is not the original past returning, and the represented future is not an event already occurring. Both appear as present representations. The represented object may therefore be absent or illusory while the current cognitive operation and any resulting biological state transition are real present processes. A remembered injury may alter bodily readiness now; an imagined future may generate present tension, anticipation, or preparation. This distinction prevents the reality of the present process from being confused with the reality of the represented event. [9, 10, 114, 115]

Perception must be distinguished from this memory-dependent representational movement. Perception, as the term is used here, refers to present organism-relative biological integration: the inside-view organization through which current sensory and bodily conditions are registered relative to the organism's capacities, present state, retained history, and available modes of response. It is not a detached or neutral recording, and it should not be treated as a generic early sensory stage. It is functionally prior to the recursive audit's explicit recognition, naming, ownership, comparison, narration, and report. [29, 71, 96, 99, 106, 136, 137, 191–194]

This distinction does not imply that ordinary perception occurs in complete isolation from memory, expectation, prediction, or conditioning. Prior organization can shape salience, discrimination, anticipation, and interpretation from the earliest stages of processing. The narrower claim is that present organism-relative integration is not identical to the subsequent conceptual reconstruction through which thought names, compares, explains, or narrates what has occurred. The operations are closely coupled, but they are not therefore the same operation. [29, 71, 95, 99, 100, 106]

In ordinary experience, perception and thought occur in such close temporal and functional proximity that they are easily conflated. A shape is registered and almost immediately recognized as a chair; a sound is heard and identified as a closing door; a facial expression is integrated and interpreted through retained relational history. The rapidity of these transitions does not erase the distinction. It shows how quickly present integration is recruited into the organism's accumulated cognitive organization. [71, 99, 106, 136, 137]

Skilled perception illustrates the same relation. A woodworker may look at a board and immediately register grain direction, cupping, internal tension, likely movement, structural weakness, or suitability for a particular joint. Years of experience may be recruited with little explicit deliberation. The board and its present material properties are not produced by memory, while retained craft knowledge shapes what those properties imply for action. Memory informs the encounter without exhausting the current event or becoming a separate observer of it.

A novel sound provides another example. Auditory registration may occur before its source is recognized. Thought may then recruit memory, comparison, and projected consequence: what produced the sound, whether it has occurred before, whether it indicates a physically disruptive condition, and whether action is required. The present registration and the subsequent movement of recognition, evaluation, and projection are functionally related but not identical.

The relevant asymmetry is therefore not between an entirely unconditioned perception and a conditioned thought. Present biological integration is itself organism-relative and historically shaped. The asymmetry is that current conditions can constrain the organism in ways that its retained representations do not freely determine. A physical event, bodily condition, or directly evident relation can expose an incompatibility that the prevailing cognitive organization cannot resolve merely by rearranging its existing content. This provides the proposed basis on which perception can reorganize the thought that interprets it. [22–24, 56, 57, 100, 101]

Direct perception names a specific case of this relation. It is not the acceptance of a proposition about an event or mechanism, the repetition of a correct statement, the possession of accurate terminology, or the conclusion of a chain of reasoning. Nor is it equivalent to introspective report, which describes already formed thoughts, images, feelings, or interpretations through memory and language. Direct perception refers to an operative relation becoming presently evident in a way that constrains the organization through which it had previously been interpreted.

Direct perception must not be described as an act performed by a psychologically separate perceiver. Such language would reintroduce the virtual observer that the framework derives as a product of thought. The more precise formulation is that the relation becomes evident, the causal order is exposed, or the governing organization is perceived as one movement. The apparent observer is not standing outside the relation and reaching a superior conclusion about it.

Thought can represent the proposition that an organization is false while that organization continues to govern experience. It can remember, defend, explain, and compare the proposition with alternatives. Direct perception has a different proposed consequence. When the operative relation becomes evident, the previously governing organization may become incapable of coherently containing what has been perceived. The incompatibility is not merely stored as a competing statement; it is registered in the relation itself.

Conceptual representation: proposition acquired -> retained as knowledge -> previous organization may continue to govern.

Direct perception: operative relation becomes evident -> incompatibility is directly registered -> previous organization loses governing viability.

Once a relation has been perceived, it may later be described, communicated, and incorporated into accumulated knowledge. That later representation is not the original perceptual event. It is the retained consequence of the event within an altered biological and cognitive history. This distinction is essential because knowledge can preserve the description of a transformation without reproducing the transformation itself. [5–10, 96, 114, 115]

The Santa Claus example provides a simple illustration. A child may be told repeatedly that Santa Claus is fictional while the established belief continues to organize expectation and interpretation. The contrary statement may remain additional knowledge competing with the existing organization. Directly observing the parents placing the presents does not automatically guarantee reorganization, because the event could still be rationalized. But when the relation among the parents, the presents, and the prior story becomes directly evident as incompatible with the former literal interpretation, the previous organization loses viability. The child has not merely acquired another sentence; the relation has changed what the earlier organization can coherently explain.

The former organization need not be erased. The child may remember having believed, describe the story, participate in its cultural performance, or imaginatively entertain it. What has changed is its governing authority as a literal account. Memory of the organization remains possible after sincere organization through it has become nonviable.

A stage illusion demonstrates the same structure without relying upon childhood belief. A spectator may initially organize a visual display as a person being divided by a saw because the presentation is constructed to sustain that interpretation. Once the mechanism becomes directly evident, the same display may remain visually striking. Nevertheless, the earlier organization can no longer govern the event as an actual bodily severing. The sensory presentation need not disappear; what changes is the viability of the interpretation.

These examples also show why direct perception should not be identified with emotional intensity, surprise, persuasion, or dramatic experience. A highly charged event may fail to reorganize the structure through which it is interpreted, whereas a quiet perception may permanently constrain a governing relation. The relevant criterion is not how forcefully an event is felt but whether the prior organization remains capable of coherently organizing what has become evident.

Attention must likewise be distinguished from thought and from durable Insight. Complete attention is an interval of undivided present organism-relative awareness in which thought operating through psychological time is absent. No memory-dependent movement is reconstructing the psychological past, projecting an imagined future, comparing present actuality with an identity or ideal, narrating the event through the virtual reference point, or generating one thought from another. Present phenomenology and biological responsiveness nevertheless remain.

The organism can continue to register light, sound, bodily sensation, movement, spatial relation, affective tone, and environmental change. Sensory integration and biological regulation continue. The absence of psychological time is therefore not the absence of consciousness, phenomenology, or biological activity. It is the absence of active memory-dependent thought reconstructing, naming, comparing, projecting, narrating, or recursively continuing itself.

Between movements of thought there can therefore be an interval in which psychological time is absent. That interval is silence. Silence, as the term is used here, does not denote the absence of environmental sound. Nor does it denote unconsciousness, sensory deprivation, sedation, dissociation, or cognitive impairment. It denotes the absence of active thought operating through psychological time while present organism-relative awareness remains.

Attention names the undivided registration of present actuality, whereas silence names the absence of psychological time within that interval. Thought is not being suppressed or held away by a separate controller. The apparent controller is historically authored and presently maintained by the very memory-dependent movement that is inactive during complete attention. The silence is therefore not authored by a silent self.

This relation provides the architectural definition of meditation used here. Complete attention establishes that psychological time can be absent while awareness remains. Meditation, in the structural sense developed in this section, is that silent interval: present organism-relative awareness without active thought operating through psychological time. Meditation is defined by the organization of the interval, not by the outward form of a practice intended to facilitate it.

Posture, repeated phrases, controlled respiration, visualization, and concentration upon a selected object may alter arousal, autonomic regulation, attentional stability, or cognitive content. Such practices may have important biological and practical effects. Their performance does not, by itself, establish the absence of psychological time. A repeated mantra, for example, may narrow cognition and reduce competing narration, but the repetition remains memory-dependent symbolic activity while it is occurring. A method may facilitate silence without being identical to silence. [36, 43, 59, 149]

Effortful concentration is organized differently from complete attention. Concentration generally entails selection, exclusion, monitoring, correction, and repeated return to an intended object. It can limit competing cognition, but it remains structured by an objective and by the temporal relation between a present condition and a desired future condition. [68, 149]

Present state represented as insufficient -> desired future state projected -> method and effort applied -> anticipated attainment.

This sequence is psychological becoming. The content may be contemplative, but the operative organization remains the movement of retained past and projected future around the virtual reference point. The attempt to attain meditation can therefore reproduce the psychological time whose absence meditation is intended to describe. This does not make contemplative practice useless; it means that the method and the condition must not be conflated.

A temporary interval of complete attention must also be distinguished from durable recursive reorganization. Attention demonstrates that psychological time can cease without eliminating phenomenology or practical cognitive capacity. It does not, by itself, establish that the organization which later reinstates cognition has lost viability. When attention loosens, memory-dependent thought may resume with its previous frequency, authority, ownership, and recursive continuity. [149]

This distinction becomes important in the later derivation of choiceless awareness. 'Choiceless' does not denote passivity, incapacity, or failure to respond. It denotes awareness that is not continuously selected, directed, or maintained by an independently existing chooser. Where the self-generating movement or conditioned continuity of cognition remains unperceived, the loosening of attention may reactivate ownership, comparison, psychological becoming, and recursive thought. Where those organizations have lost viability, thought may arise when practically required without automatically reconstructing a controller or acquiring unnecessary continuation.

The analysis therefore preserves four principal distinctions. Thought is accumulated knowledge and memory active through psychological time. Perception is present organism-relative biological integration and is not reducible to the thought that may rapidly recognize or interpret it. Direct perception is an operative relation becoming presently evident in a way that may render a previous recursive organization nonviable. Complete attention is present awareness without active thought operating through psychological time, and the resulting interval is silent. Meditation is that silence while awareness remains; it is not the method undertaken in an attempt to obtain it.

These distinctions establish the basis for the next stage of the argument. If direct perception is not merely another item of knowledge, the framework must explain how ordinary knowledge acquisition differs from recursive reorganization and how an organization can remain available as memory while losing its governing authority over subsequent experience.

15.5 Knowledge Acquisition and Recursive Reorganization

The distinction between knowledge acquisition and Insight is central to the present account. Both processes produce biological change. Each can alter memory, association, expectation, behaviour, and future response. They should not, however, be treated as differing only in degree. The proposed distinction concerns the organization affected by the change: knowledge acquisition modifies the contents and relations available to cognition, whereas Insight alters which recursive organization remains viable as the governing structure of subsequent experience. [94, 96, 99, 101, 200, 203]

Knowledge acquisition ordinarily adds to, differentiates, corrects, or reorganizes retained content. New information is encoded, existing associations are strengthened or weakened, and new relations are established among representations. Through practice, a skill may become more accurate, efficient, or automatic. Through instruction or experience, the organism may acquire a factual proposition, explanatory model, category, rule, technique, or practical sequence. These changes can substantially expand what can be remembered, predicted, communicated, and done without necessarily altering the governing organization through which the new material is interpreted. [94, 96, 97, 99, 101, 203]

Knowledge acquisition can therefore be represented in general form as follows:

> Existing recursive organization -> new information or experience -> retained content is modified -> the existing governing organization continues to interpret and use that content.

The resulting cognitive architecture may become more informed, differentiated, and capable while its governing reference structure remains substantially intact. A person can learn a language, acquire a scientific concept, improve a practical skill, or understand a philosophical argument while experience continues to be organized around the established virtual reference point as apparent thinker, evaluator, controller, or owner. The new material enters accumulated knowledge and becomes available to subsequent thought operating through psychological time. [5–10, 68, 69, 72, 96–100, 147, 195]

Knowledge can therefore be extensive, sophisticated, and accurate without being transformative in the specific sense developed here. A person may know that worry is unproductive while continuing to worry, understand that anger is physiologically costly while continuing to organize an encounter through injury and defence, or accept that the psychological self is biologically constructed while continuing to experience that self as the independent author of thought. In each case, the knowledge need not be superficial or false. Its limitation is structural: it remains representational content within the recursive organization it describes. [12, 13, 21, 101]

This limitation is especially important when knowledge concerns the knower itself. The statement "the self is constructed" can be retained, explained, defended, and appropriated by the established virtual reference point as "I understand that the self is constructed." The content has changed, but the organization of ownership may remain intact. Knowledge can describe the causal movement without rendering that movement nonviable. The fuller reason why knowledge cannot stand outside the knower will be developed later; the present point is that accurate description and governing reorganization are not identical.

Insight is proposed to involve a different kind of change. Rather than merely adding information to the prevailing organization, an operative relation becomes directly evident in a way that the governing organization can no longer coherently contain. Direct perception is not an act performed by an independent perceiver standing outside the structure. The relation itself becomes evident, exposing an incompatibility on which the prior organization depended. The transformation therefore concerns governing viability rather than the mere presence of a competing proposition.

The distinction may be stated directly: learning modifies content within an existing recursive organization; Insight changes which recursive organization remains capable of coherently governing experience. The difference is not determined by emotional intensity, suddenness, complexity, or the amount of information acquired. A gradual accumulation of observation may culminate

in recursive reorganization, while a dramatic event may add only a vivid memory. Conversely, an intellectually sophisticated conclusion may leave the governing organization intact, whereas a simple relation becoming evident may render it untenable. The decisive question is not how much has been learned, but what can no longer continue to govern.

Before Insight, a particular organization structures interpretation. It influences which relations are noticed, how present events are explained, which expectations are generated, and which responses appear coherent. After Insight, that same organization may remain available as memory. It can be recalled, described, or intentionally reconstructed. What has been lost is its sincere and unquestioned organizing authority.

> Knowledge acquisition: existing organization -> new content incorporated -> existing organization interprets the content -> governing structure remains viable.
>
> Recursive reorganization: existing organization -> operative relation becomes directly evident -> incompatibility is registered -> governing viability is lost -> subsequent experience can no longer be organized in the same way.

Practical learning illustrates why knowledge can reorganize behaviour without necessarily reorganizing the knower. A task such as tying a shoe, obtaining a measurement, or completing a repair is constrained by an independently existing condition. An ineffective procedure can be replaced because the task supplies an external criterion of success and a point of completion. Once the requirement is resolved, the operation can terminate. Knowledge about the psychological self is organized differently because the apparent knower, the knowledge, and the entity supposedly applying that knowledge arise within the same recursive movement. This distinction will become central when the limits of knowledge, resistance, will, and method are examined. [68, 97–99, 203]

The Santa Claus and stage-illusion examples introduced in the preceding subsection illustrate the same general structure. Contrary information may be absorbed while the established interpretation remains viable. Reorganization occurs only when the operative relation or generating mechanism becomes evident in a way the former organization can no longer coherently explain. The earlier organization need not be erased; it can remain available as memory, cultural performance, or recognized appearance after losing literal governing authority.

Recursive reorganization therefore does not require deletion of former content. It requires a change in the viability of the organization through which that content previously structured experience. A prior belief, identity, interpretation, or self-description may remain fully representable after it can no longer be sincerely occupied as the governing account of what is occurring.

This distinction also clarifies why direct perception should not be equated with emotional force. A dramatic experience may fail to reorganize anything, whereas a quiet perception may permanently constrain a governing interpretation. The relevant criterion is not how forcefully an event is felt but whether the previous organization remains capable of coherently organizing the relation that has become evident.

Transformative force and objective accuracy must also be kept separate. A compelling but mistaken interpretation can reorganize memory, expectation, evaluation, behaviour, and social response. A false accusation may permanently alter how one person interprets another. A misunderstood event may reorganize identity or anticipation despite an inaccurate account of what occurred. Delusional organization can likewise become biologically powerful and resistant to revision. Durability, confidence, and emotional intensity therefore do not establish that the relation producing reorganization was accurate. [61, 100, 101, 204]

A scientific account must consequently assess at least two independent dimensions. The first is structural: has a previous recursive organization genuinely lost governing authority? The second is epistemic: is the relation through which that reorganization occurred supported by the relevant evidence? A transformation may be structurally genuine while epistemically mistaken. Conversely, a proposition may be evidentially accurate while remaining only additional knowledge within the prior organization.

Insight is therefore defined structurally as a candidate form of recursive reorganization in which direct perception renders a previously governing organization incapable of coherently organizing subsequent experience in the same way. Scientific evaluation of any claimed Insight remains separately concerned with accuracy. Where the perceived relation is well supported, reorganization may bring cognition into closer alignment with present conditions. Where the relation is incomplete or mistaken, the same general capacity for reorganization may establish an inaccurate governing structure.

The distinction between knowledge acquisition and recursive reorganization can now be stated precisely. Knowledge acquisition enriches, corrects, or extends the contents of memory and association while the governing recursive organization may remain intact. Insight alters the viability of that governing organization. The previous structure may remain accessible as memory, but it can no longer exercise the same sincere interpretive authority once the relation on which it depended has become directly evident as untenable.

The next subsection examines this mechanism more closely. It develops the proposal that direct perception constrains a prior recursive organization through negation, explains why the old organization need not be erased, and distinguishes loss of governing viability from the acquisition of a competing belief.

15.6 The General Mechanism of Insight: Constraint Through Negation

The distinction between knowledge acquisition and recursive reorganization permits the proposed mechanism of Insight to be stated more precisely. The mechanism is intended to remain invariant across the particular organization brought into perception.

The target may be a belief, perceptual assumption, fear, explanatory model, self-protective interpretation, or the movement through which thought historically authors and presently maintains the virtual reference point. What remains constant is the proposed manner in which a previously governing organization loses the capacity to organize subsequent experience in the same way.

Present conditions are not encountered from an unconditioned or historically neutral standpoint. Each event enters a bounded living organism already shaped by accumulated knowledge, memory, conditioning, expectation, present biological state, prior cognitive organization, and established patterns of response. The event is therefore rapidly incorporated through the organization most capable of rendering it coherent under the conditions then operating. This does not require a consciously selected theory or an independently existing interpreter. [22–24, 56, 57, 96–101]

> Present event -> activation of accumulated knowledge and memory -> assimilation through the prevailing recursive organization -> differential evaluation and biological response -> expectation, action, or further cognition.

The phrase prevailing recursive organization denotes the organization currently capable of assimilating the event, not an explicit belief chosen in advance. A child may interpret wrapped presents through the Santa Claus organization. A spectator may organize a stage illusion through assumptions about bodily continuity, visible space, and the apparent action of the saw. Criticism may be organized through retained structures of injury, rejection, status, or identity, while anomalous data may initially be interpreted through the scientific model already governing inquiry. In each case, novelty first encounters an organization already available within the organism's history. [5–10, 22–24, 56, 57, 96–101]

Conditioned assimilation does not prevent learning. New information may be incorporated, associations modified, qualifications added, and exceptions created while the central organization remains viable. A sufficiently flexible structure can absorb substantial contrary information by reinterpreting the event, postponing resolution, recruiting additional explanation, or modifying peripheral content without surrendering its governing assumptions. Anomalous or contradictory information is therefore not, by itself, sufficient to produce Insight. [94, 96, 99, 101, 203]

> Present event -> existing organization activated -> new information incorporated, qualified, or reinterpreted -> governing organization remains viable.

Insight is proposed to occur when assimilation through the prevailing organization is no longer coherent. An operative relation becomes directly evident in a way that the existing structure cannot contain without invalidating an assumption required for its own continued authority. The difficulty is not merely that the organization lacks another fact. The relation on which it depended can no longer be maintained as a coherent account of what is occurring.

The governing proposition is therefore: recursive reorganization occurs when direct perception renders an existing recursive organization incapable of coherently organizing present experience in the same way.

> Present event -> interpretation through the prevailing recursive organization -> attempted assimilation -> operative incompatibility becomes directly evident -> loss of coherence -> loss of governing viability -> recursive reorganization.

The term nonviable requires careful qualification. It does not imply that the biological pathways supporting the former organization are instantly erased, nor that the earlier interpretation can no longer be remembered, described, simulated, or intentionally reconstructed. The organization may remain available as memory, historical knowledge, conceptual understanding, linguistic representation, or an imaginatively reproduced point of view. What changes is its capacity to govern present experience sincerely and without contradiction.

The Santa Claus belief and the stage illusion provide simple illustrations. Once the generating relation becomes evident, the former interpretation can remain representable and portions of the appearance may remain compelling. The child can still recount the story, and the spectator can still see the visual illusion. What does not return unchanged is the prior organization's literal governing authority. These examples are not the mechanism itself; they make visible the distinction between retained content and lost viability.

Constraint refers to this loss of governing authority. The relation that has become evident constrains the previous organization because the latter can no longer operate coherently as though the incompatibility had not been registered. No external controller is required to suppress the structure, and direct perception does not perform an evaluation that the structure should stop. The organization loses viability through the relation exposed within its own operation.

This distinguishes constraint through Insight from suppression. In suppression, the former organization remains viable but is opposed, inhibited, concealed, or overridden by a competing intention. Continued monitoring and effort are required because the suppressed organization retains sufficient authority to reassert itself. In Insight, by contrast, the former organization no longer possesses the same coherent basis from which to govern. It may remain accessible, but it does not have to be repeatedly defeated by an internal controller. [68, 149, 202]

> Suppression: prior organization remains viable -> competing intention opposes it -> monitoring, correction, and effort are repeatedly required.

> Constraint through Insight: operative incompatibility becomes directly evident -> prior organization loses governing viability -> no independent controller is required to maintain its defeat.

Negation, as the term is used here, does not mean verbal denial. It does not consist in repeating that an organization is false, nor in allowing one proposition to defeat another through assertion alone. Constraint through negation occurs when direct perception

establishes what the previous organization can no longer coherently be. The negation is structural: the relation on which the prior organization depended is no longer viable as the basis of interpretation.

Insight is therefore characterized as much by what can no longer organize experience as by what has become newly understood. A positive replacement may follow. A mistaken model may be replaced by one that better accounts for the available evidence, and an ineffective practical assumption may be replaced by an organization that supports successful action. In such cases, negation and replacement occur together.

> Prior organization rendered nonviable -> alternative organization becomes available -> subsequent experience is organized through the alternative relation.

A replacement organization is not, however, necessary in every case. The primary transformation may be the removal of an assumption without the construction of an equivalent positive centre. This possibility becomes especially important when the target is the self-generating movement of thought.

The previous organization may contain the assumptions that an independent thinker produces thought, that an observer stands apart from what is observed, or that an evaluator exists separately from the movement being evaluated. When the generating relation becomes directly evident, these assumptions lose coherence. Thought is seen to have historically authored and presently maintained the virtual thinker; the observer and observed are revealed as formations within one movement; and the evaluator is not independent of the evaluated process.

No replacement identity is required to claim ownership of this reorganization. Constructing a new centre described as the one who has transcended thought, overcome the self, or attained a superior state would preserve the same reference structure in altered content. The structural negation is complete only to the extent that no independent thinker, observer, evaluator, or owner is reintroduced as the beneficiary or author of the change.

This also explains why assertion alone cannot produce Insight. A person may repeatedly state that the thinker is thought, the observer is the observed, the evaluator is the evaluated, or the self is constructed. Such propositions may accurately describe the architecture while remaining knowledge appropriated by the established virtual reference point: "I understand the theory," "I know that the observer is generated," or "I possess the correct account." The content changes while the organization of ownership remains viable. [5–7, 69, 147, 195]

Direct perception differs because the generating relation becomes evident in operation rather than being represented only as a proposition. No independent perceiver stands outside the movement and chooses to negate it. The causal order is exposed, the contradiction on which the prior organization depended becomes untenable, and the organization loses governing viability. This does not guarantee that every perceived relation is factually accurate; structural reorganization and epistemic accuracy remain distinct questions, as established in the preceding subsection.

The general mechanism can therefore be summarized in four movements. First, accumulated knowledge and memory provide the recursive organization through which a present event is initially assimilated. Second, new information is ordinarily incorporated without altering that organization's central governing assumptions. Third, an operative relation becomes directly evident that is incompatible with an assumption required by the organization. Fourth, the prior organization is constrained through negation: it may remain representable, but it loses the authority to organize subsequent experience in the same way.

> Present event -> assimilation through existing recursive organization -> direct perception of an incompatible relation -> loss of coherence -> loss of governing authority -> recursive reorganization.

This account remains architectural. It does not yet specify the complete biological implementation through which governing viability is lost, nor does it establish the extent, stability, or temporal course of every reorganization. Those questions require later analysis of residual pathways, recurrent activation, biological stabilization, behavioural consequences, and measurable Friction Signatures. The narrower claim is that Insight is not fundamentally the accumulation of another item of knowledge. It is the constraint of a governing recursive organization when direct perception renders that organization incapable of coherently organizing experience in the same way.

The next subsection applies this mechanism to the movement through which thought generates the virtual self. The mechanism remains unchanged; what changes is the target. Rather than an isolated belief within the recursive audit, the target becomes the historically accumulated and presently maintained reference point through which cognition is organized as belonging to an apparent thinker, observer, evaluator, controller, owner, and potential sufferer.

15.7 Insight into the Self-Generating Movement

The general mechanism of Insight does not change when the organization brought into perception is the self-generating movement. An operative relation becomes directly evident that the prevailing organization cannot coherently contain; the prior organization is constrained through negation and loses its former governing authority. The potentially extensive consequence does not arise from a different category or higher grade of Insight. It arises from the scope of the organization brought into perception.

In many cases, Insight concerns a relatively bounded belief, expectation, interpretation, or explanatory model. A child perceives the relation that makes a literal Santa Claus explanation untenable, a spectator perceives the mechanism underlying a stage illusion, or a scientist encounters a relation that an existing model cannot coherently contain. In each case, a particular

organization loses viability while the apparent individual who learns, discovers, or understands remains largely unquestioned. When the target is the self-generating movement, however, the organization brought into perception is not one isolated item within thought. It is the recursive movement through which thought historically authors and presently maintains the apparent one who thinks, remembers, evaluates, observes, controls, chooses, owns, seeks, and suffers.

Ordinary cognition reverses this causal order. Thought appears to be produced by a pre-existing thinker; evaluation appears to be performed by an independent evaluator; memory appears to be retrieved by an enduring rememberer; and choice appears to originate from an internal controller. Experience is consequently organized as occurring to, being observed by, and belonging to a continuous psychological subject.

The preceding architecture derives the opposite sequence. Memory, comparison, projection, language, evaluation, imagery, narration, and behavioural preparation are biological and cognitive operations. Across development, these operations are repeatedly indexed through reconstructed past, projected future, ownership, social attribution, fear, desire, success, injury, and anticipated consequence. This accumulated organization progressively authors a virtual reference point. Once established, subsequent cognition recruits, reactivates, updates, elaborates, and maintains that reference point while attributing its own operations to it as their independent source. [5–10, 68, 69, 72, 96–102, 147, 195]

Historical formation: memory, language, comparison, ownership, evaluation, fear, desire, social conditioning, and repeated indexing -> virtual reference point.

Ongoing maintenance: present cognition recruits and updates the established reference point -> thought, memory, evaluation, and action are attributed to it as "mine" -> the generated reference point appears to have preceded and authored the process.

The apparent thinker is therefore not the original biological source from which thought emerges. The causal reversal can be stated accessibly:

The self does not author thought; thought authors the self.

This line is deliberately concise, but it does not imply that a single thought creates a complete self once and for all. The self is historically accumulated rather than instantaneously manufactured anew during each cognitive event. Ongoing thought then recruits and maintains the established reference point, giving its continuity the appearance of an enduring entity that existed prior to the processes through which it was formed. [5–7, 69, 147]

A second accessible formulation makes the dependency equally direct:

The self is thought as memory. Subtract thought as memory, and what is left of the self?

This question is not offered as a slogan, a verbal proof, or a denial of the living organism. It identifies the relation to be examined. The organism, its body, biological history, present physiology, regulatory processes, practical capacities, and conventional identity remain. What is placed in question is the apparently independent psychological entity whose continuity, authorship, ownership, and projected future depend upon the present reconstruction of retained experience through thought.

Memory is central to the appearance of psychological continuity. The past event itself does not return. A present reconstruction occurs, and that reconstruction is indexed to the established virtual reference point: "I remember what happened to me." The apparent continuity of the rememberer is inferred from the recurrence of this indexing relation. Memory therefore does more than preserve information. In conjunction with self-reference and psychological time, it supplies the temporal material from which the psychological subject is reconstructed. [5–10]

Language further stabilizes the reference point. Terms such as "I," "me," and "mine" are practically necessary for communication, planning, responsibility, and social coordination. Their utility does not establish an ontologically independent inner controller. Repeated linguistic attribution nevertheless makes the generated centre appear substantial: "I thought this," "I chose that," "I felt this," or "this happened to me." The grammatical subject is then mistaken for the independent biological author of the processes attributed to it. [6, 7, 71, 100, 102, 147]

Social conditioning adds detail and persistence. The organism is assigned a name, family position, occupation, reputation, history, group membership, and anticipated future. Praise, criticism, reward, punishment, comparison, and recognition are repeatedly directed toward the same named reference point. Experience becomes organized through an accumulated account of who the person is, what they have done, how they are regarded, and what they are expected to become. The reference point becomes increasingly elaborate without becoming an independently existing entity. [6, 7, 100]

Comparison contributes another mode of authorship. Functional differences in ability, appearance, status, possession, or behaviour become organized as statements about the virtual self: better or worse, ahead or behind, successful or deficient, secure or incomplete. Comparison converts a present relation into psychological identity and projects that identity through time. [69, 100, 147]

Fear and desire extend the same movement. Fear projects injury, loss, humiliation, or incompleteness; desire projects satisfaction, recognition, security, or completion. Both organize a represented future around the apparent entity that will later suffer or obtain the projected outcome. [9, 10, 12, 13, 56, 57, 114, 115]

Retained past -> present self-evaluation -> projected future threat or fulfilment -> biological state transition -> further cognition and action organized around "me."

This is psychological becoming. The virtual self is represented as presently insufficient and moving toward a future condition in which it will become secure, admired, worthy, complete, or fundamentally transformed. The projected solution is generated by

the same organization that generates the sense of insufficiency. The movement therefore renews both the apparent problem and the apparent entity whose completion is being pursued.

Ownership strengthens the same structure. Thoughts, feelings, injuries, achievements, relationships, objects, beliefs, and social roles become organized as mine. This is not limited to legal or practical possession. It is the psychological indexing through which content becomes part of the organization maintaining the virtual reference point. Once a belief, role, injury, or achievement is organized as mine, its defence can become indistinguishable from defence of the apparent self. [69, 72, 140–147, 195]

The self is consequently neither one representation nor a discrete object located at a single position within the organism. It is the recurrent reference generated through the coordination of many operations. Memory reconstructs continuity; language names and stabilizes it; comparison defines it; fear defends it; desire projects its completion; ownership binds content to it; social conditioning supplies roles and expectations; and evaluation organizes represented consequences as significant to it. These processes do not add properties to a pre-existing psychological self. They participate in historically authoring and presently maintaining the apparent self whose properties they seem merely to describe. [5–10, 69, 72, 96–102, 147, 195]

Insight into this movement must therefore be distinguished from correction of a particular self-belief. A person may discover that they are not as talented, powerless, admired, rejected, virtuous, or inadequate as previously assumed. Such a realization may reorganize an important part of identity while leaving the reference structure intact: "I formerly believed I was this, but now I know I am that." The content changes, while the apparent possessor of both the old and new identities remains unquestioned.

The same distinction applies to conceptual accounts of self-construction. A person may learn that identity depends upon memory, language, social conditioning, predictive organization, or neural activity and may accurately explain those dependencies. The established virtual reference point can appropriate this knowledge as another possession: "I understand that the self is constructed." Conceptual sophistication therefore does not establish that the generating relation has become directly evident. [69, 147, 195]

Direct perception concerns the complete movement as it operates. Thought is seen to have historically authored and presently maintained the apparent thinker. Evaluation is seen to generate the apparent evaluator rather than to originate from a neutral centre. Psychological time is seen to reconstruct continuity. Ownership is seen to convert changing content into possessions of an apparent centre. The causal reversal becomes evident in operation: the apparent self does not stand prior to thought and produce it; thought operating through psychological time produces and sustains the apparent self.

The movement can be summarized as follows:

> memory and conditioning -> representation through psychological time -> evaluation -> biological state transition -> recruitment of the established virtual reference point -> ownership and attempted control -> further thought.

Thought supplies the apparent observer, the observed content, the problem, the value assigned to the problem, and the imagined future resolution. There is no genuinely independent psychological subject standing outside this movement. The observer is thought represented as an observer, and what it observes is another formation of thought. The process recursively encounters its own products while mistaking an internal division for a relation between two independent realities.

This perception exposes a structural contradiction. The prior organization treats the thinker as the independent source of thought, although the thinker is historically authored and presently maintained by thought. It treats the observer as separate from the psychologically observed content, although observer and observed are formations within the same conditioned movement. It treats the evaluator as neutral, although the standards, comparisons, fears, desires, and projected consequences constituting evaluation arise within the evaluated organization. It treats the controller as outside cognition, although intention, command, resistance, and attempted control are themselves cognitive and biological events.

The causal descriptions cannot retain equal authority. The thinker cannot coherently remain the independent source of thought once the relation through which thought authors the thinker becomes directly evident. The observer cannot stand outside the psychological movement when the observer-response is one of that movement's conditioned products. The evaluator cannot occupy an independent position when the apparent evaluator and the evaluated content are generated within one organization. The controller cannot stand apart from the controlled movement when control is another formation of that movement.

The propositions "the observer is the observed" and "the evaluator is the evaluated" refer to an internally generated psychological division. They do not imply that the organism is identical to an external object, nor do they deny physical causation or real biological state transitions. Where an external physical event is presently occurring, its occurrence and causal consequences are real. Where thought reconstructs a past event, the event may have been real when it occurred, but the present reconstruction is not the event occurring again. Where thought projects a possible future, the represented event is not presently real and may never occur. In each case, the present representation and any biological transition it produces are real present processes, while the positive or negative meaning attributed to the representation, and the apparent evaluator to whom that meaning supposedly belongs, are generated within the same cognitive movement. [9, 10, 114, 115]

When fear is observed by an apparent "me," the observer-response may consist of memory, naming, judgement, avoidance, projection, and the desire to control fear. These responses are not outside the psychological movement of fear; they can extend and intensify it. Condemnation of insecurity may be organized by the demand to become secure. Judgement of desire may itself express psychological becoming. An attempt to control thought may be another thought represented as the controller. In this precise sense, the observer is the observed process represented as an observer, and the evaluator is the evaluated movement represented as an evaluator. [12, 13, 21, 56, 57, 114–116, 119, 202]

These formulations are not contemplative slogans. Repetition can strengthen memory and shape expectation while leaving the organization of ownership intact. Their function is to compress an architectural sequence in which thought authors a reference point, present cognition recruits that reference point, activity is attributed back to it as its independent act, and recursive attribution conceals the causal order. Insight concerns direct perception of that order, not verbal agreement with its description.

The loss of governing authority does not make the virtual self unrepresentable. Personal history can still be recalled, conventional self-reference can continue, and the organism can respond to its name, describe its past, plan future action, accept responsibility, and use the word "I." What is constrained is the interpretation of that practical reference as an independently existing psychological entity standing prior to and outside the processes through which it is generated and maintained. [5–10, 68, 69, 72, 96–102, 147]

The claim is therefore not that the organism, memory, thought, individuality, or practical distinctions between bodies cease to exist. The organism remains a bounded living system with a particular body, biological history, physiology, location, and repertoire of possible responses. Selection, inhibition, planning, correction, and action remain real biological functions. What loses viability is the additional interpretation that these distributed operations are authored, owned, and supervised by a separate internal entity. [68, 72, 116]

The consequences may be unusually extensive because the self-generating movement participates in the organization of memory, identity, responsibility, action, fear, desire, relationship, injury, achievement, self-security, psychological becoming, and suffering. When a bounded belief loses authority, one domain of experience may reorganize. When the apparent centre claiming authorship and ownership loses authority, every organization dependent upon that division is potentially affected.

This does not imply that all conditioning is instantly erased, that every self-referential thought disappears, or that practical cognition ceases. Historical pathways remain biologically available, and organizations not encompassed by the perception may continue to operate. When attention loosens, thought may arise and the established reference point may still be recruited through retained pathways. The relevant question is whether that recruitment regains the same unquestioned authority and recursive continuation. [94, 96, 101, 203]

The present claim is therefore specific. Insight into the self-generating movement applies the general mechanism of constraint through negation to the organization through which thought historically authors and presently maintains its apparent author. Once this causal relation becomes directly evident, the previous interpretation of the self as independent thinker, observer, evaluator, controller, owner, and sufferer can no longer retain the same unquestioned governing authority.

The next subsection examines why conceptual knowledge of this relation is ordinarily insufficient, why descriptions of "ego resistance" mistakenly attribute independent agency to a generated reference point, and why will, suppression, effort, and method cannot substitute for direct perception of the self-generating movement itself.

15.8 Why Knowledge, Resistance, Will, and Method Do Not Reorganize the Structure

The architecture developed in the preceding subsections constrains any account of psychological transformation. If the apparent self is a virtual reference point historically authored and presently maintained by thought operating through psychological time, that reference point cannot also be treated as an independently existing agent capable of standing outside the process, examining it from a neutral position, and deciding to reorganize it. Explanations that attribute Insight to the self's knowledge, resistance, will, surrender, or disciplined use of method therefore risk restoring as a causal primitive the very entity the framework has derived as an effect of recursive cognition.

This does not imply that knowledge, inhibition, effort, practice, or deliberate regulation are biologically ineffective. Each can alter memory, behaviour, attention, arousal, autonomic state, and the probability of later cognitive events. The narrower claim is architectural: none of these operations, merely by occurring, establishes that the recursive organization generating and maintaining the virtual reference point has lost viability. They must therefore be distinguished from the proposed mechanism of Insight, in which an operative relation becomes directly evident and constrains a governing organization through negation. [68, 94, 101, 116, 149, 202, 203]

Conceptual knowledge is insufficient because it can be incorporated as additional content while the existing reference structure remains intact. A person may learn that identity depends upon memory, language, social conditioning, organism-relative organization, or recursive processing. The account may be accurate and scientifically sophisticated. Nevertheless, the established virtual reference point may remain positioned as the knower, possessor, interpreter, and defender of that account.

> New proposition encountered -> stored as knowledge -> retrieved through thought -> indexed to the established virtual reference point -> "I understand this" -> governing self-organization remains viable.

The statement "the self is constructed" can therefore become another possession of the apparent knower: "I understand that I am constructed." The content has changed, but the organization of ownership remains. Knowledge can describe the causal movement without rendering that movement nonviable.

The distinction becomes especially clear when instrumental knowledge is compared with knowledge concerning the knower. Instrumental knowledge can correct an operation because the operation is constrained by an independently existing condition and has a terminating criterion. A shoe is untied, the appropriate motor sequence is learned or recalled, the shoe becomes tied, and the practical requirement ends. A measurement is missing, the measurement is obtained, and the task proceeds. The external relation supplies a criterion by which ineffective organization can be corrected and cognition can terminate. [68, 97, 99, 203]

Instrumental knowledge can correct an operation because the operation has an external constraint and a terminating condition. Knowledge cannot dissolve the psychological self because the knower, the knowledge, and the entity supposedly applying the knowledge are products of the same recursive organization.

The Santa Claus example reveals the same structural limit. A child may be told that Santa is fictional, repeat the statement accurately, and retain it as knowledge while the literal organization continues to shape anticipation and interpretation. The proposition alone may be absorbed by the prior structure. What changes the governing relation is not the possession of correct words but the operative relation becoming directly evident in a way the former organization can no longer coherently contain. Knowledge may describe what is false while the organization described remains viable.

The same distinction appears in ordinary psychological conflict. A person may know that worry is unproductive while continuing to worry, understand that resentment prolongs injury while repeatedly reconstructing the injury, or recognize that comparison produces dissatisfaction while continuing to organize identity through comparison. Knowledge may modify interpretation, support temporary restraint, or create conflict between a newly accepted proposition and established organization. It does not necessarily remove the viability of the movement producing the conflict. [12, 13, 21, 56, 57, 119]

Conceptual agreement and direct perception therefore differ in kind rather than merely in intellectual strength. Conceptual agreement represents the causal claim that thought authors the apparent thinker, that the evaluator is generated within the evaluated movement, or that psychological time reconstructs continuity. Direct perception concerns the operation itself as it occurs. The causal relation becomes evident rather than remaining a proposition possessed by an apparent knower. Knowledge describes the architecture. Direct perception may constrain the architecture described.

A further difficulty arises when accurate conceptual knowledge is converted into a desired psychological outcome. A person may know that the apparent self is generated by thought and then form the intention, “I want to perceive this directly,” or “I want to achieve the Insight that the self is not independent.” At that point the content of knowledge may be correct while the movement through which it is being applied reproduces the very divisive organization under examination.

The present condition is evaluated as insufficient, a future condition of deeper perception is projected, and the apparent evaluator is organized as the one who must move from one state to the other. Desire therefore reinstates psychological time: “I am this now, but I want to become that.” The evaluator–evaluated division is already active within the attempt to overcome it. The virtual reference point is consequently maintained not despite the effort to perceive its constructed character, but through the structure of the effort itself.

This explains why conceptual knowledge cannot simply be intensified until it becomes direct perception. The problem is not insufficient intellectual conviction. When the knower attempts to use knowledge to produce a future state of Insight, the same recursive organization can appropriate both the knowledge and the desired transformation. Direct perception differs because it does not require a projected psychological endpoint or an independent evaluator attempting to reach it; the operative relation becomes evident as the movement occurs.

The persistence of the prior organization is frequently explained by saying that the ego resists change, protects its identity, fears its own ending, or refuses to let go. Such language may summarize defence, avoidance, attachment, inhibition, or recurrent self-protection, but it becomes misleading when those processes are attributed to an independently existing self. A virtual reference point produced and maintained within recursive cognition cannot stand outside that cognition and resist its own exposure as an autonomous agent.

A more parsimonious account is that what appears as resistance is the continued operation of an organization that remains viable. Present events continue to be assimilated through accumulated memory, conditioning, expectation, comparison, projection, ownership, and self-reference because no directly perceived relation has yet rendered that organization incoherent. Transformation does not need to be actively blocked. Continuation is the default condition of a structure that can still organize what it encounters.

> Existing recursive organization remains viable -> present experience continues to be organized through it -> new knowledge may be assimilated -> continuation persists until an operative relation becomes directly evident and renders the organization nonviable.

No separate Santa-defending agent is required to preserve the child's belief, and no illusion-defending self is required to sustain the spectator's initial interpretation. Each organization continues because it remains capable of assimilating the event. In the same way, memory, language, ownership, comparison, fear, desire, projection, and social conditioning can continue to recruit and maintain the virtual reference point without requiring an ego that independently chooses its own continuation.

Fear, defence, and attachment may nevertheless contribute materially to that continuation. The error lies not in acknowledging those processes but in reversing their causal order. A bounded organism can undergo real protective responses without a psychologically separate self. Psychological fear concerning the ending, injury, humiliation, insecurity, or incompleteness of "me" is organized through memory, projection, ownership, evaluation, and present biological transition. The established virtual reference point is then recruited as the apparent subject of the fear and the author of the defensive response. [22–24, 56, 57, 101, 114, 115]

> Conditioned cognitive and biological movement -> memory, projection, ownership, and evaluation -> present biological transition -> established virtual reference point recruited -> fear, defence, and resistance retrospectively attributed to "me."

The same constraint applies to will and choice. Commands such as "I will stop identifying with thought," "I will end psychological time," or "I will become free from conditioning" are themselves movements of thought. They arise through retained knowledge, dissatisfaction with the present, comparison with an imagined alternative, desire for a result, and projection into the future. The command is then attributed to the apparent controller whose authority it appears to demonstrate.

> Present state represented as inadequate -> desired future state projected -> command generated -> command attributed to "me" -> established controller-reference recruited and reinforced -> psychological time continues.

The controller is not newly created in full by each command. It is the historically formed virtual reference point recruited and strengthened through the effort to transform the process from which it arose. The attempt to end the self through will can therefore preserve the organization of selfhood as the one who intends, measures, succeeds, fails, and hopes to arrive.

This conclusion does not deny biological regulation. The organism can inhibit an action, redirect attention, maintain a task, follow a plan, suppress an impulse, correct an error, and modify behaviour through learning and effort. These are real operations of distributed biological organization. The framework rejects only the additional claim that an ontologically independent inner agent originates them from outside the causal process. [68, 116, 203]

Will can alter outward behaviour without rendering the organization producing that behaviour nonviable. Anger may be concealed while psychological injury and defence remain intact. A thought may be suppressed while ownership of both the thought and the suppressive command persists. Silence may be maintained through effort while comparison, monitoring, desire, and projected attainment continue through psychological time. Control can modify expression, frequency, or context without changing the causal organization from which the controlled event arises. [68, 116, 202]

Insight is therefore not the achievement of an entity that finally succeeds in controlling itself. Nor does this make Insight random or causally unconditioned. Prior knowledge, inquiry, complete attention, environmental circumstances, biological state, repeated observation, and the loosening of established interpretation may all contribute to conditions in which the relevant relation becomes perceptible. The claim is that no virtual controller performs the reorganization. When the operative incompatibility becomes directly evident, the previous organization loses viability as a structural consequence of the relation perceived.

Method introduces a related difficulty because it commonly organizes transformation as movement from a deficient present toward a desired future. A method specifies a present condition, a prescribed action, an anticipated result, and an apparent individual who will travel from the first state to the second. Where the goal concerns psychological freedom, the resulting structure remains psychological time even when its content appears to oppose the self.

> Present self represented as incomplete -> desired transformation projected -> prescribed method applied -> progress evaluated -> future completion anticipated -> virtual reference point maintained through psychological time.

The contradiction is structural. The virtual reference point attempts to acquire its own absence as a future achievement. Thought is applied to reach the ending of thought. The chooser chooses a future in which no chooser is presumed to govern. The controller attempts to control the process that generates and maintains the controller. Increased effort does not resolve the contradiction. It can strengthen the striving organization through repeated judgments of progress, failure, attainment, loss, comparison, and renewed effort.

This distinction is particularly important for meditation. Prescribed practices can alter respiration, autonomic regulation, attentional stability, arousal, affect, and cognitive load. Repetition may reduce competing narration, and concentration may narrow the field of cognition. These effects can be biologically significant and practically useful. They should not, however, be identified automatically with meditation or Insight as defined in the present architecture. [36, 37, 43, 59, 149]

Meditation was defined earlier as the silent interval in which thought operating through psychological time is absent while present organism-relative awareness remains. A method may alter the conditions under which such an interval occurs, but performance of the method is not identical to silence. Deliberate mantra repetition remains memory-dependent symbolic activity while it is occurring. Effortful concentration continues to involve selection, exclusion, monitoring, correction, and intention. Evaluation of progress continues to organize experience around the established virtual reference point.

Method: prescribed repetition modifies state, behaviour, attention, or conditions. Insight: an operative relation becomes directly evident and renders a governing recursive organization nonviable.

A temporary state produced through absorption, fatigue, suppression, narrowed cognition, or sustained concentration does not establish that the governing organization has been reorganized. When the state ends, the prior organization may resume with its earlier authority and recursive continuity. State alteration and structural loss of viability are therefore different claims.

Method may nevertheless contribute indirectly. It may reduce physiological arousal, stabilize attention, limit distraction, or make the movement of thought easier to observe. It may also expose the operation of effort, desire, comparison, authority, and projected attainment. The decisive distinction concerns causal sufficiency: alteration of conditions is not equivalent to the loss of governing viability.

When a practice becomes an authority, identity, promise, hierarchy, or path to personal completion, it can reinforce the organization the inquiry is intended to expose. It supplies a route, a future, a measure of progress, and a practitioner who seeks to become. The method may change its language while preserving the same psychological movement.

Rejecting method as the direct mechanism of Insight does not imply passivity or refusal to investigate. It requires a distinction between seeking a promised result and looking to find out. Reward-directed method begins with a conclusion about what should

be attained and organizes present observation according to that anticipated outcome. Experience is then evaluated as evidence of progress, failure, proximity, or distance relative to the projected state.

Looking to find out begins without a protected psychological conclusion or promised reward. Thought, memory, evaluation, desire, fear, projection, ownership, and the appearance of an observer or controller are examined as they operate. The inquiry is directed toward the actual relation rather than toward making present experience conform to a prescribed description.

> Attainment-directed method -> projected outcome -> prescribed action -> progress evaluated by the virtual reference point -> psychological time continues.

> Looking to find out -> present observation without a protected conclusion -> operative relation may become directly evident -> possible reorganization if the governing structure loses viability.

This distinction must not itself be converted into a covert method. Instructions to remain in not-knowing, avoid desire, reject authority, or observe correctly can immediately become new standards of effort and identity. The virtual reference point may adopt the self-description of one who follows no method, thereby acquiring another form through which to continue. Looking to find out neither guarantees Insight nor prescribes a result. It describes inquiry that does not begin by forcing perception to confirm an anticipated psychological reward.

The architecture therefore excludes four mistaken causal accounts. Knowledge can describe the self-generating movement without constraining it. Apparent resistance is the persistence of a recursive organization that remains viable, not an act performed by an independent ego. Will can regulate behaviour and attention without standing outside the process as the source of transformation. Method can modify biological and cognitive conditions without necessarily rendering the governing organization nonviable. None of these distinctions denies the efficacy of learning, regulation, or practice; they specify the limits of what those processes establish.

The proposed mechanism remains unchanged. Present observation may permit an operative relation to become directly evident. The relation proves incompatible with an assumption required by the governing organization. The organization is constrained through negation and loses its former authority. Nothing independent must resist, surrender, choose, or maintain the transformation. Once the relation upon which the previous organization depended becomes directly evident, that organization can no longer coherently govern in the same way.

> Present observation -> operative relation becomes directly evident -> incompatibility with the governing organization -> constraint through negation -> loss of governing authority.

The next subsection examines what becomes evident when the target is the self-generating movement itself. Because organisms possess different biological histories, conditioning, language, social organization, and representational content, the perception cannot be reduced to one universal sentence or image. The proposed invariant lies in the causal relation exposed: the apparent author of thought is a virtual reference point historically authored and presently maintained by thought operating through psychological time.

15.9 What Is Perceived When the Target Is the Self?

The preceding subsection established that conceptual knowledge can describe the self-generating movement without necessarily constraining it. A proposition concerning the constructed, virtual, or thought-generated character of the self may enter memory, become available to later thought, and be claimed by the same apparent knower whose status the proposition appears to question. The present issue is therefore not which sentence should be accepted, but what causal relation must become directly evident when the organization brought into perception is the self.

No verbal formula is equivalent to that perception. Statements concerning the thinker, observer, evaluator, controller, or virtual self may accurately compress elements of the proposed architecture, yet they remain representations. They can be learned, repeated, defended, or incorporated into a philosophical, scientific, or contemplative identity while the organization of ownership remains intact. The formulations developed earlier are therefore summaries of a causal relation, not instructions or substitutes for its direct perception.

The invariant architectural claim can be stated precisely: what becomes directly evident is the operation through which thought, functioning through psychological time, historically authors and presently maintains the virtual reference point experienced as self. The target is not a hidden object that must be located or disproved somewhere within the organism. It is the continuing movement through which memory, comparison, projection, evaluation, language, ownership, and narration generate the appearance of an independent author and owner of experience.

> Historical formation: accumulated memory, language, comparison, ownership, evaluation, fear, desire, social conditioning, and repeated indexing -> progressively authored virtual reference point.

> Present operation: a condition or representation recruits the established reference point -> cognition, evaluation, action, or biological transition is attributed to it as "mine" -> the generated reference point appears to have preceded and authored the process.

This distinction prevents a common displacement of the inquiry. A search may be organized for a permanent inner object; no such object is located; and the conclusion "there is no self" is then claimed by the same apparent investigator. The content of the inquiry has changed, but the organization of the independent knower may continue. Direct perception concerns the movement that generates the investigator, not merely the failure of that investigator to discover a hidden entity.

The target cannot therefore be reduced to one occurrence of the word "I," one bodily image, one autobiographical memory, or one explicit self-representation. Each can participate in the organization of selfhood, but none independently constitutes the complete movement. The virtual reference point is historically formed across many relations and then repeatedly recruited, reconstructed, updated, and maintained as changing content is indexed to the same apparent centre. [5–10, 69, 72, 96–102, 147, 195]

What becomes evident is the causal order joining the entire movement: retained organization supplies a represented past; thought projects a possible future; the condition is evaluated through accumulated standards and expectations; a real present biological transition may occur; the established virtual reference point is recruited as the one threatened, rewarded, injured, deficient, or fulfilled; an apparent observer or controller then attempts to manage the movement; and that attempted control becomes further thought.

> Retained memory -> projection through psychological time -> conditioned evaluation -> present biological state transition -> virtual evaluator or sufferer recruited -> ownership and attempted control -> further thought.

The entire evaluative organization - the apparent evaluator, the threatened or rewarded self, and the projected positive or negative future - is one movement of thought operating through psychological time. The apparent observer is not outside the internally represented content. The observer-response is another formation within the same movement, while the external object or physical event, where one is presently occurring, remains physically distinct from the organism.

Fear may provide one route through which this organization becomes visible. A presently occurring physical condition may initiate real causal consequences and real protective responses. A remembered event may also recruit fear, but the past event is not occurring again; the present remembrance is a reconstruction. A projected future event is not presently real and may never occur, although the projection and any biological transition it produces are real present processes. In each case, memory, projection, evaluation, bodily activation, and the demand for psychological security can recruit the virtual reference point as the one to whom the feared consequence will happen. [9, 10, 22–24, 56, 57, 101, 114, 115]

A further response may then appear as an observer or controller who judges, resists, suppresses, or attempts to escape the fear. What becomes evident is that this observer-response is not outside the fearful organization. Naming, memory, comparison, projection, condemnation, avoidance, and attempted control are continuations of the same conditioned movement. In this precise sense, the observer is the observed psychological process represented as an observer. [12, 13, 21, 56, 57, 114–116, 202]

Desire and ambition can expose the same architecture through psychological becoming. A present condition is represented as insufficient, an object or future state is projected, and fulfilment is represented as something that will complete, secure, or transform the apparent self. The seeker appears to exist before the seeking and to travel through time toward the result. Direct perception may instead reveal that remembered insufficiency, comparison, projected reward, and desire jointly generate and maintain the seeker represented as moving toward completion. [9, 10, 98, 114, 115]

The projected endpoint may be material, social, therapeutic, intellectual, moral, or spiritual. The architecture does not depend upon the content of the desired result. Its relevant feature is the movement of psychological time generating an apparent individual who will become something in the future. The problem and the projected solution are produced within the same organization, and both renew the entity whose completion is being pursued.

Shame and comparison may make the evaluator-evaluated division especially visible. A remembered event, social judgement, ability, appearance, status, or possession is measured against an internalized standard and converted into evidence of what the apparent self is. Thought then produces an evaluator who condemns, defends, excuses, or attempts to correct the identity generated by the same comparison. The judge and the judged identity are formations within one movement of memory, conditioning, evaluation, and psychological time. In this precise sense, the evaluator is the evaluated movement represented as an independent judge. [56, 57, 69, 100, 147]

Social approval and intellectual authority extend the same structure. Thought reconstructs or anticipates the standpoint of others and organizes praise, criticism, belonging, status, or rejection around the established virtual reference point. Knowledge, rationality, originality, scepticism, competence, or theoretical ownership may likewise become psychological possessions whose challenge is represented as a threat to the knower. The apparent intellectual owner is maintained through memory, language, comparison, recognition, and appropriation of ideas, not discovered as an independent entity behind them. [6, 7, 69, 100, 102, 147]

Control provides another route. An intention, command, correction, or preferred outcome arises and is attributed to an apparent centre: thought represents itself as the controller of thought. The command may regulate behaviour, redirect attention, inhibit an action, or sustain a practical task; those biological capacities are real and are not denied. The perceptual issue concerns the additional interpretation that an independently existing agent originated the controlling event from outside cognition. When command, evaluation, projected outcome, and ownership are registered as one movement, the apparent controller is exposed as the controlled process occupying a virtual controlling position. [68, 116]

Ownership and attachment make the same relation visible through appropriation. A thought becomes "my thought," pain becomes "my injury," a belief becomes "my belief," and a role, relationship, achievement, or remembered event becomes part of "my" identity and continuity. Repeated attribution is then mistaken for evidence that an owner existed before the owned content. Direct perception reverses this causal order: ownership participates in generating and maintaining the appearance of the owner. [69, 72, 140–147, 195]

Attachment does not require a pre-existing psychological self that subsequently becomes attached. Memory, fear, projection, evaluation, and appropriation can organize an object, relationship, role, or belief as necessary to the continuity of "me." The

threatened reference point is recruited within that movement and retrospectively represented as the possessor who was present before attachment began.

Traumatic conditioning requires particular precision. A harmful event may have been physically real when it occurred, and enduring effects upon memory, salience, autonomic regulation, expectation, bodily response, and behaviour may remain biologically real in the present. The present reconstruction of the event is not the event occurring again, although the reconstruction and the state transition it produces are real present processes. Perceiving the self-generating movement does not imply that retained conditioning, sensitization, or memory immediately disappears. [101, 114, 205]

The relevant distinction concerns the additional recursive organization through which retained effects are appropriated as the identity and continuity of an independent sufferer. A traumatic response can arise within a bounded living organism without requiring an ontologically separate owner behind it. This preserves the reality of the historical injury and present biological consequences while declining to treat the virtual sufferer as their independent source or possessor.

Relational conflict may recruit especially dense configurations of the virtual reference point. A present remark can activate years of retained history, and cognition may become organized as the injured child, rejected partner, responsible parent, disrespected worker, misunderstood spouse, or threatened authority. The earlier events are not returning; their present reconstructions are shaping the current state. What becomes evident is that the role-bound self is being reconstructed now through memory, ownership, evaluation, and projection rather than merely recalling a past that belongs to an already established psychological entity. [5–10, 22, 56, 57, 114, 115]

Because different relationships and conditions recruit different retained configurations, reorganization may be extensive in one domain while self-generating structures remain active elsewhere. This variation does not imply separate selves. It reflects the variable pathways through which the historically formed reference point is recruited and maintained.

Religious or contemplative becoming can preserve the same architecture in a refined form. The apparent self imagines purity, salvation, liberation, enlightenment, or transcendence and adopts a path intended to carry it toward that future condition. The content may reject ordinary ambition while retaining the same temporal structure: present insufficiency, an idealized endpoint, a method, and an entity who will become transformed. What becomes evident is that the seeker and its imagined completion are generated within the same movement of memory, desire, authority, comparison, and projection.

This does not reduce every religious or contemplative practice to psychological becoming. It establishes only that sacred language, disciplined practice, and rejection of worldly identity do not automatically escape the architecture of the virtual self. A self can adopt the identity of one who seeks to end the self, thereby preserving the same causal reversal under transformed content.

These pathways are not separate truths about selfhood. They are organism-relative expressions through which the same generating relation may become visible. One organism may encounter the architecture most clearly through fear, another through achievement, shame, approval, control, intellectual certainty, family identity, attachment, religious becoming, or the desire to end self-reference. The content varies because biological history, language, conditioning, relationships, and current state vary. [6, 7, 22–24, 56, 57, 100]

No universal sentence, image, emotion, or prescribed state can contain the precise conditioned organization of every organism. The invariant lies in the causal structure: thought supplies the represented past and projected future, evaluation assigns psychological significance, the virtual reference point is recruited as the one affected, and further thought is attributed to that reference point as its independent act.

Not every movement of thought must continue recursively. Practical cognition may terminate in communication, action, correction, planning, or resolution when an independently present requirement has been met. The target here is the organization through which representational content supplies its own apparent necessity, recruits a psychological centre, and continues through ownership, evaluation, projection, and attempted control even when no present practical requirement remains unresolved. [68, 97–99, 102]

The distinction between invariant architecture and variable content has methodological consequences. Verbal agreement cannot serve as the sole criterion of reorganization. Identical words may arise from conceptual belief, direct perception, philosophical allegiance, spiritual identity, or scientific understanding while the underlying organization differs. Report can provide evidence, but the framework also anticipates consequences in recursive continuation, self-defensive interpretation, psychological ownership, evaluator-evaluated conflict, autobiographical recruitment, and the measurable Friction Signatures associated with sustained self-referential processing. Those consequences are addressed later; the present subsection identifies the relation whose governing authority is proposed to change. [12, 13, 21, 69, 119]

A broadly consequential reorganization requires more than accepting the general statement that selfhood is constructed. It concerns the common relation joining the processes through which apparent continuity and authority are maintained. Thought attributes cognition to a virtual centre; memory reconstructs changing events as belonging to the same subject; language stabilizes attribution; comparison defines psychological identity; fear projects injury; desire projects completion; ownership supplies possessions and wounds; social conditioning assigns roles and standards; and psychological time carries the reference point from reconstructed past through evaluated present toward imagined future. [5–10, 69, 72, 96–102, 147, 195]

These operations should not be treated as an inventory that must be consciously inspected one item at a time. They are interdependent expressions of one recursive organization. What becomes directly evident is the causal order joining them: the

apparent self is not the independent source to which these processes belong; it is the virtual reference point historically authored and presently maintained through their operation.

This variation must not be described as a hierarchy or as different levels of Insight. The mechanism remains constant: an operative relation becomes directly evident, the governing organization is constrained through negation, and its former authority is lost. What varies is the extent of the self-generating organization encompassed by the perception. A perception may constrain one fear, identity, attachment, relationship, or form of control while other configurations continue. A broader architectural perception may expose the common causal movement across several forms of psychological time. The difference is one of target and scope, not kind, rank, or spiritual status.

> Content-limited perception -> one conditioned organization loses governing viability -> associated self-organization is constrained in that domain -> other self-generating pathways may continue.

> Broad architectural perception -> the common self-generating movement becomes evident across multiple forms of psychological time -> the virtual reference point loses authority across a wider range of conditions.

This formulation also accommodates residual pathways. The later appearance of self-referential content does not by itself demonstrate that no reorganization occurred. A word, memory, bodily response, role, or relational stimulus may activate retained organization, particularly when complete attention loosens. The relevant question is whether the content again recruits ownership, evaluation, projection, and prolonged self-defensive continuation, or whether it arises, fails to recover its former authority, and ends without effort. [94, 96, 101, 203]

A thought such as "I was insulted" may reconstruct the past, recruit the virtual sufferer, project future consequence, and continue through defence and comparison. Alternatively, the words or memory may appear through a retained pathway without rebuilding the full evaluator-evaluated organization. Immediate loss of governing authority and the longer biological stabilization of changed recruitment should therefore remain distinct questions.

The central conclusion is consequently specific. Insight into the self cannot be reduced to a doctrinal statement, a search for an absent inner object, or one universal content of experience. What becomes directly evident is the dynamic organization through which thought operating through psychological time historically authors and presently maintains the apparent thinker, observer, evaluator, controller, owner, seeker, and sufferer. The conditioned pathway through which this architecture becomes visible varies between organisms; the invariant relation is that the apparent self is not prior to the movement but is generated and sustained through it.

The next subsection examines how this virtual reference point becomes implicated in psychological suffering. It considers the false division between evaluator and evaluated, the appropriation of experience as injury or deficiency belonging to "me," the movement of psychological becoming, the search for self-security, and the recursive continuation through which thought attempts to defend, complete, condemn, or stabilize the entity it has produced.

15.10 The Generation of Psychological Suffering

The preceding architecture permits a necessary distinction between a primary physical or biological disturbance and the recursive organization through which that disturbance may become sustained psychological suffering. Physical injury may produce nociceptive activity and pain. Bereavement may produce acute grief. A presently occurring physical threat may recruit autonomic activation, attentional narrowing, withdrawal, defence, and other protective responses. These are real biological and phenomenological events and do not require an independently existing psychological self. The narrower question is how a present event, remembered event, imagined future, emotion, or biological disturbance becomes extended through psychological time and organized as the suffering of an enduring inner owner. [11–13, 22, 23, 27, 28, 205, 206]

Psychological suffering, as the term is used here, is not a substance added to experience and is not an event passively endured by a pre-existing subject. It is proposed to arise through recursive organization. A present condition may be evaluated through retained conditioning and recruit a biological state transition and cognitive representation; thought may also reconstruct a past event or project a possible future. The event, representation, assigned significance, or subjective feeling is then indexed to the established virtual reference point as belonging to the one to whom it is happening, dividing the resulting movement into an apparent evaluator and evaluated content. Defence, condemnation, comparison, resistance, ownership, and projected resolution then become new present conditions for further thought.

A working governing proposition can therefore be stated as follows: psychological suffering is sustained when present or represented experience is appropriated by a thought-generated virtual reference point treated as an independent owner, evaluator, controller, or sufferer, and when thought subsequently attempts through psychological time to defend, condemn, escape, complete, avenge, justify, or secure that same generated reference point.

This proposition does not deny pain, trauma, grief, fear, autonomic disturbance, or the biological consequences of adverse conditions. It identifies an additional recursive movement through which a response may be prolonged, intensified, or repeatedly reactivated after the initiating event has ended, changed, or become physically absent. It also does not claim that every prolonged disturbance is produced by self-referential cognition. Continuing injury, illness, environmental threat, traumatic sensitization, and other biological conditions may sustain activation independently. [11–13, 22–24, 27, 28, 101, 205, 206]

Present condition, event, memory, or projection -> conditioned evaluation through accumulated biological and psychological history stored as memory -> biological state transition and its organism-relative inside view as subjective feeling -> cognitive representation of the condition, its assigned significance, the subjective feeling, or their relation -> recruitment and maintenance

of the apparent "me" to whom the condition is represented as happening -> the apparent evaluator, operating as thought, attempts to alter, escape, defend, justify, secure, or transform that "me" -> the resulting representation functions as a new present internal stimulus -> further biological transition, subjective feeling, evaluation, and thought -> renewed division and sustained psychological suffering.

The initiating event and its recursive continuation are related but not identical. A social rejection, threatening tone, criticism, betrayal, or humiliating encounter may produce an immediate biological response while it is occurring. After the physical event has ended, thought can reconstruct it in the present: what was said, why it happened, what it supposedly reveals, what should have occurred, and what may happen next. The original event is no longer physically present. Its temporal extension is produced through present memory, interpretation, and projection. [11, 12, 22, 56, 57, 114, 115]

The distinction between event and representation must remain exact. A past event may have been real when it occurred, but the present remembrance is not that event occurring again. It is a present reconstruction. A projected future event is not presently real and may never occur. The reconstruction or projection is nevertheless a real present cognitive process, and any autonomic, metabolic, attentional, or behavioural transition it produces is a real present biological process. The represented event and the present process generated around it must not be conflated. [9, 10, 114, 115]

The causal event, biological transition, and protective response are real. The positive or negative evaluation attributed to the event or representation, and the apparent evaluator to whom that evaluation is said to belong, are generated within the same process. The framework therefore does not deny physical causation or biological response. It distinguishes those realities from the evaluative meaning through which an event becomes good or bad for an apparent psychological centre and from the virtual sufferer to whom that meaning is retrospectively attributed.

Memory does not restore the past itself. It produces a present reconstruction conditioned by retained biological history, language, current state, later experience, and established patterns of evaluation. Psychological suffering is intensified when that reconstruction is appropriated as the possession, injury, deficiency, or defining history of an enduring psychological owner. Practical recognition that an event occurred to this organism may remain necessary. The additional organization arises when the event is used to define, threaten, diminish, justify, or secure the virtual self. [5–10, 15, 96, 100, 114, 115]

> A past injury occurred -> the event is reconstructed in the present as "my injury" -> the reconstruction is evaluated as defining or threatening what "I am" -> the apparent owner must defend, explain, repair, avenge, justify, or escape the injury -> the reconstruction becomes a new stimulus for further thought.

The virtual reference point does not merely index the event. Through repeated ownership, the event becomes incorporated into the organization of "me." Injury, rejection, failure, betrayal, or humiliation may become part of autobiographical continuity. Because the psychological self is historically formed through reconstructed memory and recurrent attribution, defence of the remembered injury can become defence of identity. Thought may then preserve the representation from which it seeks relief by repeatedly reconstructing it in order to understand, justify, prevent, correct, avenge, or obtain acknowledgement for it. Each reconstruction recruits and maintains the apparent sufferer to whom the injury belongs. [5–10, 12, 13, 21, 69, 72, 114, 115, 147]

Sustained psychological conflict also depends upon an apparent division between evaluator and evaluated. Fear, anger, jealousy, shame, insecurity, grief, desire, or a disturbing thought is represented as the problematic content. A second movement then appears as an independent entity judging or controlling that content. Yet the evaluator-response is formed through memory, comparison, internalized standards, fear, desire, social conditioning, and projected outcome. It is not situated outside the movement it evaluates. [6, 7, 22, 56, 57, 100]

Fear may generate a demand for security, which is then represented as a controller attempting to eliminate fear. Shame may recruit an internalized standard, which is represented as a judge condemning the ashamed self. Desire may generate an image of completion, which is represented as an authority directing the apparent self toward fulfilment. In each case, the apparent evaluator is another expression of the evaluated organization. The evaluator is the evaluated movement represented as an evaluator.

> Fear -> demand not to be afraid -> evaluation of continuing fear -> apparent failure of the controller -> increased self-concern and further fear.

> Anger -> condemnation of anger -> conflict between present anger and an image of non-anger -> further agitation and recursive evaluation.

The psychological observer is generated within the same organization. When thought represents an apparent "me" as observing jealousy, fear, insecurity, or grief, that observer-response may consist of naming, judgement, comparison, avoidance, anticipated consequence, and desire for a different state. The observer is not neutral and does not stand outside the observed psychological movement. It is the observed movement represented in an observing position. The external event that may have initiated the response remains distinct from the organism; the identity concerns the internally generated division between the observer-response and the content it claims to observe.

Comparison supplies a further mechanism through which difference becomes psychological deficiency. Practical comparison can identify measurable differences and support effective learning or action. Psychological comparison converts a present relation into an evaluation of the virtual reference point. Thought constructs an image of what "I am," compares it with an image of what "I should be," and organizes the discrepancy as insufficiency belonging to an enduring self. [68, 98, 99, 147]

> Retained image of the self -> projected ideal -> comparison -> present insufficiency attributed to "me" -> desire for future completion -> effort and evaluation -> renewed comparison.

The compared self and the standard performing the comparison are both products of thought, yet they are experienced as an entity and an authoritative measure standing in relation to one another. Condemnation intensifies this division. A thought, feeling, memory, or action becomes evidence that the apparent self is weak, guilty, impure, unsuccessful, or unworthy. The condemning standard may derive from family expectation, social authority, punishment, religious teaching, reward history, or prior injury. Because its conditioned origin is obscured, it appears as the judgement of an independent inner authority. Thought evaluates one of its products through another and attributes the conflict to the self represented as suffering between them. [6, 7, 22, 56, 57, 100]

Resistance belongs to the same recursive organization and should not be attributed to an independent ego. An unwanted state arises; memory supplies reasons it is dangerous, shameful, painful, or intolerable; an opposing image is projected; and cognition attempts to suppress, escape, explain, condemn, or transform the state. The present condition is organized in opposition to what should replace it. The represented distance between the two is psychological time. [68, 116, 149, 202]

> Unwanted state -> projected state of absence or resolution -> effort to move from one to the other -> continuing evaluation of progress -> repeated representation and activation of the unwanted state.

Resistance can therefore become part of the mechanism sustaining what it opposes. To resist fear, thought must continue representing fear. To escape psychological injury, thought repeatedly reconstructs the injury from which escape is sought. To become free from insecurity, thought continues representing the virtual reference point as insecure. This claim does not recommend passivity before present physical threat, harmful behaviour, injustice, illness, or practical difficulty. Appropriate protection and action may be required without psychological time. The proposed mechanism concerns recursive internal opposition in which thought recreates a represented state while attempting to force itself toward a projected alternative. [68, 116, 149, 202]

Psychological suffering also operates through becoming. Thought represents the virtual reference point as presently incomplete, insecure, unloved, unsuccessful, unrecognized, unenlightened, or psychologically unfinished. It then projects a future condition in which the deficiency will be resolved. The apparent self is represented as travelling from present insufficiency toward future completion, although both the deficient self and its completed future are present cognitive constructions. [9, 10, 69, 98, 147]

> Present incompleteness generated through thought -> future completion projected through thought -> desire links the representations -> virtual self appears as the entity moving between them -> psychological time sustains the movement.

The projected solution belongs to the same movement that generates the problem. Because the virtual reference point is maintained through changing memory, comparison, evaluation, expectation, and circumstance, it has no necessary final state of permanent completion. Achievement may alter the content of self-evaluation without ending the organization of becoming; a new discrepancy can be generated from the changed conditions. The effort to complete the self therefore maintains the entity represented as incomplete.

The search for psychological self-security extends this process. A bounded living organism requires practical protection, bodily regulation, resources, shelter, and workable relationships. Those requirements concern the organism and its conditions. Psychological self-security is different: it is the attempt to establish permanent stability for the virtual reference point through changeable content such as belief, status, relationship, possession, reputation, knowledge, authority, achievement, group identity, moral certainty, or projected transformation. [23, 24]

Once such content is appropriated as "mine," alteration can be represented as a threat to the apparent owner. Contrary evidence becomes an attack upon identity; criticism of work becomes criticism of what the self is; loss of status becomes loss of value; relational change becomes a threat to psychological continuity. Selective memory, rationalization, denial, hostility, projection, comparison, and repeated narrative reconstruction may then be recruited in defence of the content. These operations do not secure an independently existing entity. They recruit and maintain the virtual entity whose permanent security is being pursued. [5–7, 15, 22, 56, 57, 69, 100, 147]

The central property of the mechanism is recursive continuation. An event or representation becomes content; the content is appropriated by the virtual reference point; the reference point is recruited as the evaluator of what the content signifies about "me"; thought produces an observer, judge, controller, defender, or projected solution; that response becomes new present content; and the new content is evaluated again through the same organization. Each output becomes a condition for another cycle.

> Event, memory, or projection -> ownership -> self-evaluation -> resistance, defence, condemnation, comparison, or becoming -> altered biological state -> further memory and thought -> renewed ownership -> continued psychological time.

Such recursion can sustain biological activation after the initiating event has passed. The trajectory may include autonomic arousal, metabolic recruitment, attentional narrowing, muscular tension, behavioural avoidance, recurrent memory activation, disturbed sleep, and other components of the broader Friction Signature. The narrower prediction is that recursive self-organization can prolong, intensify, or repeatedly reactivate a psychological trajectory in the physical absence of the original event. The framework does not attribute every instance of these biological effects to self-reference. [11–13, 16, 21, 42, 117, 119, 120]

The proposed account also specifies what would change if the relevant organization were constrained through Insight. When the evaluator is directly perceived as part of the evaluated movement, the basis of internal opposition loses coherence. Fear is no

longer divided into fear and an independent controller of fear; shame is no longer divided into a condemned self and a separate judge; desire is no longer divided into incompleteness and an independent seeker of completion; and psychological injury is no longer divided into reconstructed content and a separate owner whose continuity must be defended.

This reorganization does not require primary biological or phenomenological responses to disappear immediately. Pain may remain, acute grief may continue, fear may arise, traumatic pathways may activate, and conditioned thoughts may occur. Nor does perception perform an evaluation that such events should stop. The relevant question is whether they again recruit the virtual reference point with sufficient authority to generate ownership, evaluator-evaluated conflict, psychological becoming, and prolonged recursive continuation. [27, 28, 101, 205, 206]

Where the generating organization has lost viability, present conditions may be registered and appropriate biological or practical action may occur without the event developing into an extended self-defensive narrative. A conditioned thought or image may arise through retained pathways, but unnecessary continuation can fail to gain recursive support. The movement then terminates when the independently present practical or biological requirement ends, rather than through suppression by an internal controller.

> Present event or response arises -> present biological registration and practical response occur -> no independent evaluator-evaluated division acquires governing authority -> no prolonged self-defensive narrative develops -> unnecessary continuation fails to gain recursive support.

The cessation of recursive psychological conflict is therefore not described as one part of thought finally defeating another. The observer does not successfully control the observed, the evaluator does not perfect the evaluated, and the virtual self does not attain permanent security. The organization generating those divisions becomes directly evident and loses governing viability. Residual content or conditioned activation may still occur, but the appearance of content alone does not establish restoration of the former organization. The decisive issue is whether the content again acquires ownership, recursive gain, and sustained authority.

The architectural conclusion is limited but substantive. Psychological suffering is not identified simply with pain, grief, fear, or other difficult phenomenological content. It is proposed to be sustained when present or represented content is appropriated by a virtual reference point treated as an independent owner, divided into evaluator and evaluated, extended through reconstructed past and projected future, and recursively maintained through defence, condemnation, comparison, resistance, becoming, and the search for self-security. Insight does not promise elimination of pain, grief, fear, memory, trauma, or biological vulnerability. It proposes the possible constraint of the additional recursive organization through which those events are owned, divided, defended, and prolonged as the suffering of an independently existing psychological self.

The next subsection examines the scope of such reorganization. It distinguishes immediate loss of governing authority from the persistence of historically conditioned pathways, considers why residual activation need not restore the prior organization, and identifies the conditions under which recursive continuation would be expected to terminate rather than regain authority.

15.11 What Changes and What Remains

Any account of Insight into the self-generating movement must distinguish what is transformed from what remains biologically and cognitively available. Without this distinction, recursive reorganization could be mistaken for cognitive destruction, suppression of thought, loss of personality, dissociation, diminished consciousness, or withdrawal from practical life. The present framework predicts none of these outcomes. Insight does not eliminate the organism, erase its history, destroy memory, or terminate the capacities from which thought arises. It constrains the organization through which a thought-generated virtual reference point is treated as an independently existing thinker, observer, evaluator, controller, owner, chooser, seeker, or sufferer. [38–40, 46, 47, 73–75]

The relevant contrast is therefore not between cognition and its absence. It is between cognition organized around an apparent independent centre and cognition in which that centre no longer retains unquestioned governing authority. The bounded living organism, L1 primary phenomenology, memory, language, practical thought, learned skill, and biological regulation remain. What changes is the causal interpretation through which these operations are attributed to and organized around a separate psychological author.

The primary transformation concerns the authority of the self-generating organization. Before reorganization, thought appears to originate from a thinker standing prior to cognition. Memory appears to be retrieved by an enduring rememberer, evaluation by a neutral evaluator, and action by an autonomous controller. When the causal relation becomes directly evident, thought is no longer coherently interpreted as the product of an independent thinker. The word "thinker" may remain useful as conventional shorthand, but it no longer identifies an ontologically separate source behind the biological and cognitive process.

The same correction applies to control. Intentions, commands, corrections, and preferred outcomes are real cognitive events. The organism can inhibit an action, redirect attention, maintain a task, follow a plan, or revise behaviour. What loses authority is the additional interpretation that an inner controller stands outside the processes producing those operations and independently commands them. Regulation remains; the imagined external position of the controller does not. [17–20, 68, 116, 148, 196–199]

Psychological ownership is altered without abolishing organism-specific relations. A memory belongs to this organism's biological history, pain occurs in this body, an action has consequences for this organism and for others, and a commitment may properly be attributed to the person who made it. These practical relations remain. What is constrained is the recursive appropriation through which an event becomes evidence about, a possession of, or a threat to an independently existing

psychological owner. An injury may have happened to this organism without its present reconstruction becoming the identity and defended possession of an enduring sufferer. [5–10, 69, 72, 140–147, 195]

The observer-observed division loses authority only in its psychological form. The organism remains physically distinct from a table, another organism, a sound source, or any external event. The constrained division is the internally generated one in which fear is represented as an object observed by a separate psychological observer, desire by a judge standing outside desire, or thought by a thinker imagined to be outside thought. Naming, memory, comparison, resistance, and projected outcome are recognized as parts of the same conditioned movement rather than evidence of an independent observer.

The evaluator-evaluated division is constrained without denying real physical causation, biological state transitions, or practical correction. A presently occurring event and its causal consequences may be real. A past event may have been real when it occurred, but its present remembrance is a reconstruction rather than the event recurring. A projected future event is not presently real and may never occur, although the projection and any biological transition it produces are real present processes. What loses authority is the image of a neutral psychological evaluator standing outside these processes and assigning positive or negative meaning from an independent position. [9, 10, 114, 115]

Practical correction therefore remains possible:

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action -> consequence registered -> discrepancy identified -> correction made -> present requirement resolves.
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Recursive psychological continuation follows a different organization:

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action, memory, or projection -> meaning for "me" generated -> identity defended or condemned -> comparison with an
imagined alternative -> further thought and biological transition -> prolonged conflict.
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Psychological becoming also loses authority as a route to inward completion. Practical development remains possible: knowledge can be acquired, a skill improved, an injury rehabilitated, behaviour altered, a project completed, and preparation made for a possible future condition. What is constrained is the organization in which a psychologically incomplete self is projected toward a future identity expected to deliver permanent inward completion. Both the deficient present self and the completed future self are representations generated now. The projected future may never occur, while the present striving and biological consequences are real. [9, 10, 68, 94, 96–99, 165, 203]

Self-Security Loop: Two Sides of One Event

A living organism requires practical security. It must protect bodily integrity, regulate resources, respond to danger, and act in relation to real physical consequences. Psychological self-security is different. It begins when thought organizes memories, beliefs, relationships, possessions, status, and projected futures as “me” or “mine.” [23, 24]

The creation of the psychological self is not a prior event that later gives rise to self-security. The two emerge together. The instant perception, memory, belief, relationship, possession, status, or projected future becomes organized as “me” or “mine,” a virtual reference point is created and the self-referential audit begins. At that same moment, whatever has been identified with the self becomes vulnerable to loss, alteration, comparison, or threat. The genesis of the “me” and the genesis of psychological self-security are therefore two sides of one event.

Thought then divides its own movement into two apparent positions: the state being judged and the entity attempting to control it. Fear appears separate from the “me” trying to overcome fear; insecurity appears separate from the controller seeking permanent security. Yet both positions are generated within the same self-referential movement. The evaluator is the evaluated, and the controller is the controlled. Because the contents identified as “me” and “mine” are continuously changing, the attempt to make them psychologically secure produces contradiction between what is and what thought demands should remain, become, or cease to be. That contradiction is inner conflict, and inner conflict can shape relationship and action in the external world.

This conflict is not a moral failure or a deficiency of will. It follows from a recursively generated structure in which thought creates both the threatened self and the apparent controller responsible for securing it. Fundamental change cannot be produced through the effort of that same divided controller, because such effort preserves the separation on which the conflict depends. The self-security loop can end only when the division itself is directly perceived as one movement rather than maintained as two opposing entities.

Taken together, what changes is the authority of the self as independent thinker, controller, owner, observer, evaluator, seeker, and sufferer; psychological becoming as a route to permanent completion; and self-security as the stabilization of a virtual entity. Psychological suffering may diminish to the extent that it depends upon these divisions. The qualification is essential: pain, grief, conditioned fear, traumatic activation, illness, continuing environmental difficulty, and unresolved practical problems may remain. Organizations not encompassed by the perception may also continue. The proposed transformation concerns the loss of governing authority of the divisions through which these conditions are recursively appropriated, opposed, defended, and prolonged. [27, 28, 101, 205, 206]

Primary phenomenology remains. Insight into the self-generating movement is not suppression of the inside view. Sound, colour, bodily sensation, affective tone, spatial relation, pain, movement, and present organism-relative integration remain available. The reduction of continuous narrator-mediated occupation should not be mistaken for reduced phenomenology. Present experience may be fully available without being continuously claimed, compared, narrated, or reconstructed around the virtual reference point. [30, 37, 39, 43, 75, 191–194]

Perception remains. The organism continues to register environmental change, bodily condition, movement, physical threat, opportunity, and social information. It can recognize objects, persons, places, and relevant relations. Recursive reorganization does not detach the organism from its surroundings. It constrains the secondary interpretation that present experience requires an independently existing internal observer or owner. [29, 37, 95, 106, 136, 137, 191–194]

Memory remains. Autobiographical and practical information can still be retained and retrieved. The organism can remember its name, history, relationships, work, commitments, injuries, skills, and prior actions. What may change is the organization of present reconstruction. A past event can be recalled accurately enough for practical purposes without being mistaken for that event occurring again or continually recruited as the identity and possession of an enduring sufferer. [5–10, 96]

Language remains. The organism can speak, write, reason, explain, communicate plans, and use conventional grammar. The words "I," "me," and "mine" need not disappear. Language can index information to a particular organism, body, history, responsibility, or commitment without establishing that the grammatical subject denotes an independently existing psychological entity. [6, 7, 102]

Planning and practical projection remain. Relevant past information can be reconstructed and possible future conditions represented when a present practical, organismic, or environmental requirement calls for them. Appointments can be remembered, materials ordered, travel arranged, consequences anticipated, and complex tasks divided into steps. Practical projection and psychological becoming both employ memory and representation, but they differ in organization and termination. Practical projection addresses a requirement and can end when the requirement is resolved; psychological becoming projects a future self as the remedy for inward insufficiency and thereby preserves the movement of becoming. [9, 10, 68, 97–99, 163, 165]

Problem-solving remains. A discrepancy can recruit relevant memory, comparison, simulation, planning, action, and correction:

present discrepancy -> relevant knowledge and comparison -> possible responses generated -> action -> consequence registered -> discrepancy resolved -> cognition terminates.

The capacity for thought is therefore preserved. Thought need not disappear merely because the apparent thinker loses independent authority. What is predicted to diminish is unnecessary recruitment and continuation after no unresolved practical, organismic, or environmental requirement remains.

Learned skills remain embedded within biological organization. Motor coordination, craft knowledge, professional expertise, language fluency, social learning, and other acquired capacities do not depend upon belief in an independent thinker. A woodworker does not lose the ability to read grain direction, sharpen a tool, cut a joint, or anticipate material movement because the apparent author of those operations is perceived as virtual. Skilled action may proceed with less interference where practical correction no longer becomes an evaluation of psychological identity. [94, 96, 203]

Social functioning and responsibility remain. The organism can recognize others, maintain relationships, cooperate, honour commitments, acknowledge harm, and respond to social consequences. Statements such as "I agreed to do this," "I made that error," or "I owe you an explanation" can identify the relevant organism, history, and responsibility without positing an independent owner behind those relations. Recursive reorganization does not eliminate individuality or accountability; it removes the false causal centre to which distributed biological and social operations are retrospectively attributed.

Practical concern remains. Health, family, work, safety, justice, and possible future consequence can recruit appropriate action. A child can be protected, a failing structure repaired, winter prepared for, a financial problem addressed, or harmful behaviour confronted. The distinction is between cognition responding to a condition for which useful action or preparation is available and psychological worry that repeatedly reconstructs or projects the problem when no further action is presently possible. Insight does not eliminate concern; it may constrain the recursive addition through which concern becomes self-centred occupation. [12, 13, 21, 117]

Bodily regulation remains. Temperature regulation, energy balance, posture, respiration, cardiovascular activity, immune function, orientation, startle, and other biological processes continue without a virtual controller. Sudden physical threat can recruit autonomic activation and protective movement before extended narrator-mediated attribution. Insight into the narrator's derived status does not remove the organism's capacity to detect and respond to present danger. [22–24]

Pain remains. Tissue damage, inflammation, illness, and other biological conditions can produce pain and protective responses. The framework does not imply invulnerability or the disappearance of primary pain. What may be reduced is the recursive movement through which pain becomes a psychological identity and imagined future: "Why is this happening to me?", "Will I always be like this?", or "What has my life become?" Reduction of that continuation would not mean that the pain or its physical cause had ceased. [27, 28]

Grief remains. A real relationship may have existed, a real loss may have occurred, and the organism's world may have changed. Memory, attachment, bodily state, social organization, and expectation may be profoundly altered. The framework must not reduce grief to an illusion generated by the self. Insight may constrain the additional movement through which grief is appropriated by an independent sufferer, condemned as an unacceptable state, or prolonged through repeated reconstruction of what "I" have lost and what "my" future can no longer become. Grief may remain without the same evaluator-evaluated conflict. [206]

Sadness, preference, temperament, and recognizable personality may also remain. An organism can be affected by disappointment, limitation, empathy, or changed circumstance without that response indicating failed Insight. Preferences for particular foods, tools, environments, activities, people, and styles of work may continue. Some expressions of personality may

change where they were strongly organized around defence, comparison, approval, status, or self-security; others may persist through temperament, culture, learning, skill, and relatively stable biological tendencies. The transformation is not destruction of individuality. It is the loss of authority of an independent psychological owner imagined to stand behind individuality.

The proposed reorganization must also be distinguished from superficially similar conditions. It is not anesthesia, because phenomenology and practical responsiveness remain. It is not dissociation, because it does not require fragmentation, detachment, reduced memory access, or a sense of unreality. It is not blankness, because silence denotes the absence of active thought through psychological time while present awareness remains. It is not cognitive impairment, suppression of phenomenology, destruction of personality, or permanent inability to think. [38–40, 46, 47, 73–75]

The relevant prediction is therefore not permanent thoughtlessness. Thought may arise through retained pathways when attention loosens or when a practical requirement recruits it. Where no unresolved requirement is present, however, a thought need not acquire recursive gain, recruit another thought, and become an extended chain organized around the virtual self. No internal monitor decides that continuation is unnecessary; the organization simply fails to secure the conditions required for further recursive continuation. [149, 201]

Conventional self-reference must be interpreted accordingly. A person may say "I need to go to work," "I remember that," "I made a mistake," "I am in pain," or "I will call tomorrow." Each statement can index information to a particular organism, body, history, commitment, condition, or planned action. Eliminating personal pronouns would make communication needlessly difficult and would not establish that the self-generating organization had lost viability. [6, 7, 69, 102, 147]

The critical question is not whether the representation "I" appears, but whether it regains unquestioned authority as an independent centre, author, owner, evaluator, and controller. Functional self-reference identifies a practical relation. Ontological identification treats the reference as a separately existing psychological entity. The same grammatical form can occur in either organization; the word alone cannot reveal which relation is operating.

> Functional self-reference: this organism has an appointment -> "I have an appointment"; this organism recalls an event -> "I remember that event"; this organism made an error -> "I made an error."
>
> Ontological identification: a thought occurs -> an independent thinker is assumed to have authored it; an evaluation occurs -> an independent judge is assumed to stand outside the evaluated movement; an injury is reconstructed -> an enduring psychological owner is recruited and defended; a future is projected -> an incomplete self is imagined moving toward completion.

This prevents two opposite errors. The first is to treat every use of "I" as evidence that reorganization has not occurred. The second is to treat unusual language, including refusal of personal pronouns, as evidence that the self-generating organization has ended. A person can avoid the word "I" while remaining strongly organized around fear, status, intellectual authority, spiritual identity, comparison, or self-security. Another can use ordinary self-reference without treating that reference as an independent inner owner. The relevant distinction is organizational rather than grammatical.

The distinction between L1 primary organism-relative phenomenology and the downstream recursive narrator is especially important here. L1 integration remains. The organism can register and resolve present conditions before or without extended narrator-mediated interpretation. Physical threat can recruit protective movement, pain can withdraw a hand, fatigue can recruit rest, hunger can recruit food-seeking, grief can register loss, and a practical discrepancy can recruit thought and action. None of these operations requires an independently existing psychological controller. [22–24, 27, 28, 30, 75, 136, 137, 191–194]

The contrast can be stated as two trajectories:

> Primary organism-relative resolution: present condition -> biological transition and response -> requirement resolves -> response terminates.
>
> Recursive psychological continuation: event, memory, or projection -> virtual reference point recruited -> meaning for "me" generated -> past reconstructed or future projected -> defence, comparison, resistance, condemnation, or self-security recruited -> renewed biological transition and thought -> continued psychological time.

Insight does not eliminate the first trajectory. It constrains the second where continuation depends upon the false authority of the self-generating division. A loud noise can still startle the organism without becoming an extended judgement about being easily frightened. Pain can still produce protective action without necessarily becoming a prolonged identity and future. Grief can occur without an additional inner authority condemning grief or demanding its immediate ending. A practical mistake can be corrected without becoming evidence that an independent self is fundamentally inadequate. [22–24, 27, 28, 206]

The organism therefore remains responsive. What is reduced is the recursive division through which one conditioned movement owns, judges, opposes, defends, or attempts to complete another. Insight does not remove the capacity to experience, remember, think, respond, grieve, plan, learn, or act. It removes governing authority from the interpretation that these biological and cognitive operations require an independently existing psychological centre standing behind them.

What changes is the organization of experience around the virtual self. What remains is the living organism and its capacity for phenomenology, perception, memory, language, practical cognition, relationship, responsibility, biological regulation, and L1 resolution. The transformation is not cognitive destruction; it is recursive reorganization. What no longer possesses the same coherent basis is the false division through which these processes are retrospectively attributed to and unnecessarily organized around an independent psychological self.

15.12 Scope, Completeness, and Stability of Reorganization

Insight should not be treated as a simple all-or-nothing event. The proposed mechanism remains constant: an operative relation becomes directly evident, exposes an incompatibility within a governing recursive organization, and constrains that organization through negation. What varies is the scope of the organization brought into perception, the extent to which the relevant relation becomes evident across contexts, the historical pathways that remain biologically available, and the degree to which the altered organization becomes stable over time.

Three distinctions are therefore required. Scope concerns how widely the perceived relation had governed cognition and psychological conflict. Completeness concerns whether the governing relation itself became nonviable or only one of its contents changed. Stability concerns whether the loss of authority persists across time and context without continuous monitoring or suppression. These distinctions describe the reach and durability of one mechanism; they do not establish levels, grades, or spiritual ranks of Insight.

The self-generating movement is not expressed through one isolated belief. It appears through memory, ownership, comparison, fear, desire, social conditioning, relationship, projected completion, psychological injury, self-security, and the apparent positions of thinker, observer, evaluator, controller, owner, seeker, and sufferer. One expression may lose authority while another remains active. The relevant question is therefore not merely whether Insight has occurred, but what organization became evident, across which conditions it had governed, and where it no longer retains authority.

A governing theoretical proposition follows: an organization genuinely rendered nonviable should not regain its former authority unchanged, although associated words, memories, bodily responses, representations, and conditioned pathways may still arise. An organization that was not encompassed by the perception may continue to operate. This proposition is not assumed as an established universal law. It is a consequence of the proposed architecture and must remain open to empirical investigation.

The reappearance of content must therefore be distinguished from the restoration of governing organization. A remembered phrase may arise without becoming a defended identity. A bodily response may recur without developing into the former psychological trajectory. A related but unperceived fear may continue without showing that an already constrained organization has recovered. This distinction prevents both overclaiming complete transformation and dismissing genuine reorganization merely because biological history remains available. [94, 96, 101, 203]

Reorganization may be domain-specific. Anxiety concerning one anticipated event may lose authority when its projected character and recursive maintenance become directly evident, while fear organized around illness, rejection, finances, status, or relationship remains active through different memories and contextual cues. One form of comparison may end while comparison concerning appearance, intelligence, morality, family role, social approval, or contemplative attainment continues. A change in one content domain does not establish that the common movement of insufficiency, projection, ownership, and becoming has lost authority everywhere.

Relational conditioning can make this variation especially visible. A self-referential organization may appear inactive in solitude yet be rapidly recruited in the presence of a parent, partner, sibling, colleague, or authority figure. Different relationships activate different configurations of memory, role, injury, expectation, and defence. Relative freedom in one setting and strong reactivity in another need not indicate deliberate hypocrisy. It may reveal that distinct organizations are being recruited by different contexts. [5–7, 22, 56, 57, 100]

The same variation can occur among the apparent functions of the virtual reference point. The independent thinker may lose authority while psychological ownership remains active. The controller may be seen through while the sufferer remains unquestioned. The private self may lose force while public comparison and reputation continue to organize behaviour. These are differences in target and scope, not different mechanisms.

A broader reorganization would involve the common causal relation becoming evident across several expressions. Memory would be seen as present reconstruction rather than proof of a permanent rememberer. Ownership would be seen participating in the generation of the apparent owner. Comparison would be seen generating both the measured identity and the evaluator assigning psychological significance. Fear would be seen generating the threatened self and the controller seeking security. Desire and becoming would be seen producing present insufficiency, projected completion, and the seeker imagined to move between them.

Where this common relation becomes evident across multiple forms of psychological time, the virtual reference point may lose authority across a correspondingly wider range of conditions. This is greater scope of constraint, not a superior kind of Insight. The perceptual mechanism does not change; the range of circumstances in which the previous organization can no longer coherently govern becomes broader.

Even extensive reorganization should not be described as omniscience, perfection, or instantaneous elimination of conditioning. The organism retains a biological history. Sensory biases, emotional dispositions, autonomic sensitivities, motor habits, learned responses, language, associations, and context-specific pathways may remain. Insight changes the governing relation through which these consequences are interpreted, owned, opposed, prolonged, and recursively reinforced. It does not require every historical effect of conditioning to disappear at once. [94, 96, 101, 203]

Residual pathways are therefore compatible with reorganization. A familiar situation may activate an old association; a word may trigger a memory; a bodily sensation may recruit a former fear pattern; or a social encounter may briefly evoke comparison or defence. The decisive question is not whether content appears, but what follows from its appearance.

Before reorganization, a conditioned thought may recruit autobiographical memory, ownership, projected threat or reward, an apparent evaluator, further thought, and sustained biological activation. After reorganization, the same thought may arise through retained organization yet fail to recruit the former chain. Where no present practical, organismic, or environmental requirement calls for further cognition, the movement may receive little recursive support and terminate rapidly. [5–10, 12, 13, 21, 69, 114, 115, 117, 119, 201]

This termination must not be attributed to an internal chooser. No separate observer evaluates the thought, declares it unnecessary, and refuses continuation. The altered organization changes what the thought can recruit. Where the former self-referential relation has lost viability, the thought may fail to generate autobiographical elaboration, ownership, projected resolution, or another cognitive event. It dissolves because the recursive conditions for continuation are absent, not because a controller suppresses it.

> Suppression: thought arises -> thought is judged unacceptable -> monitoring and opposing effort are recruited -> the thought remains relevant -> conflict continues. [68, 116, 149, 202]

> Dissolution: thought arises through a retained pathway -> no present requirement and no viable self-referential continuation are recruited -> little or no recursive gain occurs -> no further thought is generated -> the movement ends.

Residual activation may consequently occur without restoration of the former trajectory. A previously habitual anxiety pattern may produce a brief bodily response or projected possibility. A remembered insult may activate words, imagery, or autonomic change. Where the governing organization has lost authority, the response should be less likely to recruit ownership, catastrophic projection, autobiographical confirmation, rehearsal, or prolonged self-defence. The relevant measure is not the complete absence of activation, but whether it develops into sustained recursive continuation. [12, 13, 21, 56, 57, 101, 202]

Immediate functional reorganization must also be distinguished from longer-term biological stabilization. The immediate claim concerns governing viability: the former causal relation loses authority, and associated content becomes less able to complete the previous recursive sequence. This change need not await large-scale anatomical alteration. Biological organization can shift rapidly through changes in activation, weighting, inhibition, coordination, and transition probability. [68, 94, 101]

Longer-term stabilization concerns what follows as the reorganized pattern repeatedly operates. Each occasion on which an old trajectory is not completed is an occasion on which it is not reinforced in its former manner. Each practical requirement resolved without autobiographical elaboration, self-defence, projected threat, or psychological becoming follows a different transition. Repeated non-reinforcement may gradually reduce the probability, duration, and biological amplification of the former movement. [94, 101, 203]

> Immediate functional reorganization: former governing relation loses authority -> unnecessary content receives little recursive support -> the old chain is not completed -> activation terminates rapidly.

> Longer-term biological stabilization: former trajectory is repeatedly not reinforced -> self-referential recruitment, chain length, and autonomic amplification decline -> the altered pattern becomes more stable across contexts.

The term biological or neuroplastic stabilization remains a candidate consequence rather than a completed mechanistic explanation. The precise neural, metabolic, autonomic, and network changes associated with durable Insight remain empirical questions. The architecture nevertheless constrains what should be examined: initiation frequency, average chain length, duration of self-referential episodes, autobiographical recruitment, projected threat, autonomic amplification, metabolic duration, recovery time, and the preservation of task-relevant cognition. [94, 101]

The expected result is not global neural quietness. Practical thought may remain intact or become more efficient, sensory integration and L1 phenomenology remain, and task-relevant processing may continue. The predicted alteration concerns the initiation and persistence of the recursive organization that previously sustained unnecessary cognition and psychological conflict after no present requirement remained unresolved.

Insight and neuroplasticity are therefore not competing explanations. Insight identifies the perceptual reorganization through which a governing relation loses viability. Neuroplastic stabilization names the candidate biological processes through which repeated operation of the altered system may become increasingly embodied and durable.

> direct perception -> loss of governing viability -> altered recruitment and transition probabilities -> repeated non-completion of the former trajectory -> longer-term biological stabilization.

Stability must ultimately be assessed across contexts rather than inferred from one report or one temporary state. Silence in a quiet room may coexist with self-defensive organization under criticism. The virtual character of selfhood may appear evident during contemplation yet become obscured during conflict, fatigue, illness, social threat, loss, or intense bodily activation. Such conditions reveal the range over which the reorganization operates and the contexts in which unperceived structures remain active.

Stable reorganization should not depend upon continuous internal control. Where ongoing monitoring, correction, avoidance, or effort is required to prevent the old organization from governing, suppression, concentration, learned regulation, or state maintenance may provide the better explanation. Stability does not mean that no conditioned content ever appears. It means that the content does not regain its former authority and does not require a controller to keep it defeated. [68, 116, 149, 202]

> Effortful maintenance: old organization remains viable -> monitoring and correction remain necessary -> suppression or replacement sustains the altered state.

Stable reorganization: old organization has lost governing viability -> residual content may arise -> little or no recursive continuation follows -> no ongoing controller is required.

The architecture therefore generates testable consequences. A claim of complete or extensive reorganization would be weakened if the same organization repeatedly regained its former authority unchanged under comparable conditions; if residual thoughts reliably recruited the same autobiographical continuation, projected threat, autonomic amplification, and behaviour as before; if continuous effort were required to maintain the change; or if practical cognition deteriorated together with unnecessary thought, suggesting global suppression or impairment rather than selective reorganization.

The framework would be supported where conditioned thoughts occasionally arise but terminate rapidly; autobiographical and anticipatory continuation are substantially reduced; corresponding Friction Signatures fail to develop or are sharply attenuated; practical cognition remains available; the change persists without continuous effort; and the former organization increasingly fails to govern across the contexts in which it had previously operated. Stability must therefore be inferred from the behaviour of the recursive organization over time, not from verbal certainty, identity claims, or declarations of permanent attainment.

The central distinctions are consequently these: retained content may remain while governing authority is lost; residual activation may occur without recursive continuation; one domain may reorganize while another remains conditioned; broader scope is not a higher level of Insight; immediate functional change can precede longer-term biological stabilization; and durable reorganization should persist without continuous control by a virtual chooser.

Insight is neither the magical erasure of biological history nor the acquisition of another belief. It is a change in what remains capable of governing. Where perception is limited, constraint may remain domain-specific. Where the common self-generating relation becomes evident across memory, ownership, comparison, fear, desire, injury, social conditioning, self-security, and becoming, the constraint may become correspondingly extensive. Historically conditioned thoughts may still arise, but an unnecessary thought need not regain recursive authority. The old pathway can remain biologically possible while the old organization is no longer psychologically governing.

The next subsection distinguishes this durable alteration in recruitment from complete attention as a temporary interval. Attention may interrupt active thought and reveal silence while leaving intact the organization that later reinstates cognition. That distinction is required before Insight into the conditioned continuity of thought can be derived.

15.13 Complete Attention, Temporary Silence, and the Return of Thought

The preceding subsection distinguished immediate loss of governing authority from longer-term biological stabilization. A further distinction is required between complete attention as a temporary condition and Insight as a reorganization of the conditions from which thought is recruited and continued. The two may occur together, but they are not identical. Complete attention establishes that thought operating through psychological time can be absent while present organism-relative awareness remains. It does not, by itself, establish that the organization repeatedly reinstating unnecessary cognition has lost viability.

Without this distinction, every temporary cessation of thought could be interpreted as Insight and every silent interval as durable transformation. The present account instead separates the organization active within an interval from the organization governing what happens afterward. Complete attention concerns the present absence of psychological time. Insight concerns whether the conditions that formerly recruited and prolonged unnecessary thought retain their governing authority when attention loosens.

Complete attention is undivided present organism-relative awareness in which thought operating through psychological time is inactive. No memory-dependent movement is reconstructing a psychological past, projecting an imagined future, comparing present actuality with an identity or ideal, narrating experience through the virtual reference point, or generating one thought from another. The resulting absence of psychological time is silence.

Complete does not refer merely to intense inspection of an object. It denotes the absence of psychological division and effortful occupation. No separate observer is attempting to attend, no evaluator is measuring whether attention is sufficient, and no imagined future condition is being pursued. Present phenomenology remains without an active controller claiming, directing, or evaluating it.

Silence does not imply cessation of biological processing. L1 primary phenomenology, sensory integration, bodily regulation, orientation, affective tone, and responsiveness to environmental change remain. A presently occurring physical event can still produce real causal consequences and recruit an appropriate biological response. Silence therefore does not mean unconsciousness, sensory deprivation, anesthesia, dissociation, cognitive blankness, or diminished phenomenology. Attention names undivided present awareness; silence names the absence of thought operating through psychological time within that interval. [38–40, 46, 47, 73–75]

present organism-relative awareness remains -> active memory-dependent thought is absent -> no past is psychologically reconstructed -> no future is psychologically projected -> no thought recruits another thought -> psychological time is absent -> silence.

Ordinary cognition often appears continuous because one movement rapidly recruits another. A sound may recruit recognition; recognition may activate memory; memory may generate comparison or association; and the resulting content may initiate projection, narration, or further thought. These transitions can occur so quickly that cognition appears to be an uninterrupted stream. The present framework instead treats cognitive continuity as a succession of recruitments. Between movements of thought there can be an interval in which no active thought is present. [68, 97–99, 201]

No controller is required to manufacture or preserve that interval. Silence is present when a movement of thought has ended and another has not been recruited. There is no silent psychological observer standing outside the interval as its owner. Present awareness remains; a later thought may retrospectively report, "There was silence" or "I was completely attentive." The report occurs after cognition has resumed and may attribute the interval to a narrator that was not actively operating within it.

This retrospective attribution can create the appearance that an enduring psychological possessor remained present throughout the silence. The architecture requires no such entity. The interval possesses an inside view because L1 organism-relative phenomenology remains, not because a separate observer privately owns awareness. The narrator subsequently reconstructs and claims the interval through memory and language.

This is the structural basis of meditation as the term is used here. Meditation is not the method employed in an attempt to produce silence; it is the silent interval present when thought operating through psychological time is absent and awareness remains. Posture, controlled respiration, repetition, ritual, concentration, and other practices may alter arousal, attention, autonomic state, or cognitive competition. Such effects may be biologically and practically significant, but the performance of a method is not identical to the interval it may facilitate. [36, 37, 43, 59, 149]

A temporary silent interval can occur while the organization that ordinarily reinstates thought remains intact. Thought may cease during complete attention and later return with the same ownership, comparison, psychological becoming, autobiographical continuation, and recursive authority. Temporary silence therefore demonstrates cessation, not necessarily reorganization.

> Temporary silence: thought ceases -> present awareness remains -> psychological time is absent -> the prior recruitment organization remains available -> thought later resumes.

> Durable reorganization: the organization sustaining unnecessary continuation loses governing viability -> thought remains biologically available -> practical cognition can arise when required -> unnecessary thought is less likely to gain recursive continuation -> silence returns without effortful control.

Choiceless awareness describes this latter organization. It does not mean that a chooser continuously selects awareness instead of thought. It refers to present awareness that is not unnecessarily directed, monitored, or repeatedly reconstructed by a virtual controller. Where the self-generating movement and conditioned continuity of cognition have lost authority, complete attention may recur without deliberate effort and unnecessary thought may fail to become the organism's compulsory occupation.

The return of thought must therefore be examined rather than treated automatically as failure. When attention loosens, a present sensation, bodily state, environmental cue, retained association, unfinished practical condition, or internally generated representation may recruit cognition. Nothing needs to have been covertly thinking during the silent interval. The biological and cognitive conditions capable of recruiting thought need only remain available. [96–100, 201]

Cognition may return because a present practical, organismic, or environmental requirement calls for identification, memory, comparison, simulation, planning, communication, or action. A sound may need to be located, a tool found, a physical hazard assessed, a question answered, or a task completed. In such cases, thought is recruited by a condition requiring resolution and can terminate when that condition has been addressed. [68, 97–99, 102]

> present unresolved requirement -> cognition recruited -> relevant memory, comparison, simulation, or planning -> action or communication -> requirement resolves -> cognition terminates.

The return of thought under these conditions does not indicate failed attention or renewed psychological disorder. Thought remains an adaptive biological capacity. The important distinction is between demand-responsive cognition and cognition that continues because its own products repeatedly become conditions for further recruitment after no unresolved practical, organismic, or environmental requirement remains.

Unnecessary cognition can resume when an internally generated representation activates memory, comparison, imagery, language, prediction, or association; the resulting content becomes a new present stimulus; and that stimulus recruits another cognitive movement. Psychological time then resumes even though the original external condition is absent, past, resolved, or wholly imagined. The represented event may not be real in the present, while the present representation and any biological transition it produces are real ongoing processes. [9, 10, 114, 115, 201]

Insight into the virtual self does not by itself complete this explanation. Thought biologically precedes the self it historically authors, and memory, association, prediction, imagery, comparison, and practical planning can operate without explicit self-narration. The conditioned continuity of cognition must therefore be examined as an organization in its own right. The next stage of the derivation must explain how conditions are evaluated, how representation is recruited, how thought becomes a new stimulus, and why one cognitive movement sometimes gives rise to another after no external requirement remains. [5–10, 68, 96–100, 201]

The return of thought must also be distinguished from retrospective recognition that silence occurred. A thought such as "That was quiet" marks the resumption of psychological time. The interval becomes a remembered object, is attributed to the virtual reference point, and may then be evaluated as an achievement, evidence of progress, or a state to be recovered.

> silence occurs -> thought resumes -> silence is reconstructed as memory -> the virtual reference point is recruited as its owner -> silence becomes an achievement or desired future state -> effort is applied to reproduce it -> psychological time continues.

The original interval may have been genuine. Its subsequent appropriation can nevertheless regenerate the seeker, evaluator, and controller. This is why phenomenological intensity, duration, peacefulness, or certainty cannot by themselves establish durable Insight. The relevant evidence appears in the transition after the interval.

The decisive questions are whether thought returns through the same habitual pathways, whether one thought rapidly recruits another, whether autobiographical narration and self-evaluation resume unchanged, whether the interval becomes a possession of the virtual self, whether effort is required to reproduce or defend silence, and whether the change persists outside a narrow setting or method. A temporary state can be profound while leaving the prior recruitment organization substantially intact.

Altered biological states may attenuate narration, reduce self-reference, change affect, or produce an unusual sense of unity. These observations may be scientifically important. They do not by themselves demonstrate that the governing organization remains constrained after ordinary conditions return. Complete attention concerns what is active within an interval; Insight concerns what remains capable of governing once the interval has ended. [45–47, 166, 167]

Concentration must also remain distinct from complete attention. Concentration selects an object or task, excludes competing content, maintains an intention, detects distraction, and applies correction. These operations are useful for skilled work, learning, and practical problem-solving. They are not errors. They differ from complete attention because memory, selection, monitoring, and an intended outcome remain active. [68, 149]

Concentration may reduce competing thought and thereby facilitate a silent interval, but the silence begins only when the selecting and controlling movement is absent. Increasing effort cannot transform concentration into complete attention while the effort, evaluator, and projected attainment remain active.

The attempt to preserve silence exposes the same distinction. Commands such as "Remain attentive," "Do not allow thought to return," or "Hold this state" reconstruct the prior interval, compare it with the present, project its continuation, and recruit a controller responsible for maintaining it. Psychological time has resumed. The attempt to preserve silence is therefore already the ending of silence in the precise sense defined here.

> thought reconstructs a prior silent state -> a controller is recruited -> continued silence is projected as an objective -> monitoring and correction are applied -> thought continues in the form of control.

This does not imply that every practical intention destroys useful attention. Directed correction remains necessary in many tasks. The claim is specific to complete attention as the absence of psychological time. A virtual controller cannot continuously maintain the absence of the thought movement through which that controller is recruited.

The contrast between temporary attention and durable reorganization can now be stated precisely:

> Temporary attention: present awareness remains -> active thought ceases -> silence occurs -> the prior recruitment organization remains available -> a cue, bodily condition, practical requirement, or internally generated representation recruits cognition -> thought resumes.

> Durable reorganization: the organization sustaining unnecessary continuation loses governing viability -> a conditioned thought may still arise -> the former recursive chain is not recruited -> the thought terminates without suppression -> silence returns without effort -> practical cognition remains available.

Complete attention therefore concerns the present state of cognition, whereas Insight concerns the organization governing later transitions. Repeated periods of authentic silence can occur while psychological conflict remains substantially unchanged. Where self-generating and self-propagating organizations remain viable, thought can return and reconstruct the same injuries, comparisons, fears, ambitions, and projected forms of completion. Even the remembered contrast between silence and disturbance can become a new measure of progress and psychological becoming.

The framework consequently predicts different temporal patterns. A temporary attentional interval may include reduced spontaneous cognition, autobiographical narration, distraction, and associated autonomic or metabolic demand, followed by a return toward the prior organization when the interval ends. Durable reorganization predicts that unnecessary thoughts will be less likely to recruit further thought, spontaneous chains will shorten, autobiographical and self-evaluative continuation will diminish, residual activation will terminate more rapidly, and the altered pattern will persist across contexts without continuous effort. [12, 13, 21, 36, 43, 117, 119, 149, 201]

A measurement obtained only during silence cannot establish which organization produced it. Scientific assessment must examine the transition into the interval, the organization present within it, and what happens when thought reappears. Relevant questions include whether effort was required, whether the old chain resumed, whether the state depended upon a narrow method or environment, whether practical cognition remained intact, and whether psychological conflict returned unchanged.

The governing distinction is therefore straightforward. Complete attention is present organism-relative awareness in which active thought operating through psychological time is absent. It establishes that awareness can remain without continuous cognition. Insight reorganizes the conditions from which thought is recruited and prolonged. Complete attention establishes that thought can cease; the next derivation must explain how thought begins, how its products become new stimuli, and how unnecessary cognitive continuity is generated.

Thought does not propagate while absent. The relevant mechanism lies in the conditioned organization operating when cognition begins again. The next section therefore develops the generation of thought before applying that architecture to the conditioned continuity through which one thought recruits another.

15.14 The Operational Architecture of Thought Generation

The preceding subsection established that cognitive thought can be absent while present organism-relative awareness remains. The next question is generative rather than merely descriptive: when thought is not already active, through what organization

does it arise, and why can its products become conditions for further cognition? The present section develops a proposed operational architecture for that transition.

The derivation does not begin with an independently existing thinker, narrator, or internal observer. Nor does it begin with language. It begins with a bounded living organism registering and resolving present conditions through an organization shaped by biological history, memory, learning, conditioning, present state, and previously established patterns of response. Much of this activity can remain sensory, autonomic, affective, regulatory, or sensorimotor. It becomes cognitive thought only where processed content is recruited into a memory-dependent representational operation available for recognition, comparison, reconstruction, imagery, language, prediction, simulation, planning, communication, or later action. [22–24, 68, 96–99, 102]

The architecture does not claim that every biological transition is thought, that every thought must produce another thought, or that cognition exists only for self-reference. It proposes a sequence through which an organism-relative condition can recruit cognitive representation; through which the resulting representational content can function as a present internal stimulus that, through conditioned evaluation, may recruit a biological state transition; and through which the altered condition can terminate in action or resolution, or become fresh material for further cognitive recruitment.

15.14.1 No Neutral Computational Standpoint

A bounded living organism does not encounter either its environment or its own internally generated activity from a neutral computational position. Every sensory event, bodily condition, memory, image, association, and representation enters an organization already shaped by biological history, accumulated knowledge, conditioning, prior injury and relief, success and failure, learned expectation, present physiology, and available patterns of response. [22–24, 56, 57, 94, 96, 100, 101]

Nothing is cognitively recruited from nowhere and for no relation. A condition may be organized as relevant or irrelevant, familiar or unfamiliar, resolved or unresolved, expected or unexpected, possible or impossible, consistent or discrepant, requiring action or requiring no action. These differentiations need not appear as verbal judgments. Even content treated as insignificant has been evaluated as insignificant.

This yields the foundational proposition:

There is no neutral computational standpoint. Cognitive thought is memory-dependent and operates through psychological time. Its recruitment is therefore necessarily evaluative.

Evaluation is used here in a precise and broad sense. It does not refer only to an explicit statement such as "this is good," "this is bad," or "I want this." It refers to the conditioned differentiation through which a relation, memory, possibility, discrepancy, image, or operation acquires or fails to acquire relevance for continuation. The physical condition, biological transition, and action are real processes. The status assigned to the condition as significant, insignificant, threatening, rewarding, complete, incomplete, or psychologically necessary is generated within the organism's conditioned organization rather than residing as an observer-independent property in the event itself.

The causal point can be stated compactly:

> No evaluation -> no differential relevance. No differential relevance -> no particular cognitive recruitment.

Evaluation is therefore not merely something thought performs after thought has appeared. The evaluative organization is among the conditions through which a particular thought is recruited in the first place.

15.14.2 From Organism-Relative Condition to Cognitive Thought

The initiating condition may be external or internal. It may be a sensory event, bodily state, unresolved practical discrepancy, memory activation, learned association, image, or representation generated by preceding cognition. The condition enters an organization already formed through biological and psychological history. Conditioned evaluation may recruit or modify a present biological transition and make particular representational operations available. [22, 23, 96, 114, 115, 201]

These operations include memory retrieval, recognition, comparison, imagery, language, prediction, projection, simulation, planning, and communication. Representation does not mean language alone. It is an internally available pattern standing in for a condition, object, relation, past occurrence, possible action, or imagined future. In mature cognition, such content may be verbal, visual, symbolic, spatial, affectively interpreted, or organized as silent comparison and anticipation. [96–99, 102, 114, 115]

The proposed generative sequence is:

> *external or internal condition -> conditioned differential evaluation -> present biological state transition or change in recruitment conditions -> memory, recognition, comparison, representation, imagery, language, prediction, projection, simulation, or planning becomes available -> cognitive thought arises*

This sequence is schematic rather than a claim that biological processing unfolds in one simple serial line. Its elements may overlap, recur, and constrain one another. Its purpose is to identify the causal direction: cognitive thought is not initially issued by an already existing thinker. It arises as a memory-dependent representational operation recruited through the conditioned organization of a present organismic condition.

Not all internal activity becomes thought. Withdrawal from heat, orientation to a sudden sound, adjustment of posture, autonomic regulation, and many other biological responses may proceed without becoming cognitive representation. The transition into thought occurs where processed content becomes available for reconstruction, comparison, prediction, planning, symbolic

manipulation, communication, or recursive evaluation. Ownership as "my thought" is later still; it is not the condition that originally generates the thought. [23, 27, 28, 68, 96–99]

The same architecture also constrains why a particular thought rather than another becomes available. Because cognitive thought operates through psychological time, its representational content is drawn from an organization already shaped by accumulated memory, conditioning, learned association, present biological state, prior reward and injury, unresolved discrepancy, and anticipated consequence. A condition evaluated as threatening may preferentially recruit memories, explanations, imagined responses, defensive possibilities, or projected outcomes relevant to that threat. A state of distress may recruit a remembered person, place, image, or event previously associated with comfort, and the resulting representation may itself recruit a biological transition and corresponding subjective feeling. Specific thought content therefore does not arise from a neutral field. It becomes available according to its conditioned relevance to the organism's present state and the relation presently being evaluated. [22, 56, 57, 96, 114, 115]

This does not imply that the exact next thought is deterministically predictable from the architecture. Multiple memories, associations, representations, and possible responses may possess relevance simultaneously, while stochastic neural dynamics, attention, current physiology, and competing recruitment conditions influence which particular content becomes dominant. The architecture therefore specifies why classes of thought become more or less probable within a given condition: accumulated psychological time constrains the available field, while the organism's present evaluative organization biases which representation is recruited from within that field. [108, 149, 201]

The generative movement is ordinarily concealed in two related ways. First, the significance assigned through conditioned evaluation appears to reside inherently in the external or internal condition itself. An event is experienced as though it is intrinsically threatening, desirable, insulting, incomplete, or psychologically necessary, while the organism's accumulated history and present state in generating that significance remain unperceived. Second, where the resulting biological transition recruits cognitive representation, the thought that arises as interpretation, prediction, defence, response, or attempted resolution is subsequently attributed to the established virtual reference point as its independently authored act. The apparent sequence is therefore that an external event possesses a particular value, an already existing "me" recognizes that value as something happening to "me," and the "me" generates thought in response. The proposed causal sequence is the reverse: conditioned evaluation assigns differential significance, that significance may recruit a biological state transition, the altered condition may recruit cognitive thought, and the resulting activity is then attributed retrospectively to the virtual self.

These two forms of concealment are not separate failures of access added to an otherwise transparent process. They arise from the organization of organism-relative differentiation itself and become increasingly elaborate when that organization is represented recursively.

Division as a Mechanism of Concealment

The evaluator–evaluated division does not merely accompany concealment. It is an elaborated form of a concealment already implicit in organism-relative differentiation itself.

The division is the concealment.

This relation begins before the appearance of a mature psychological evaluator. A bounded living organism cannot encounter either an external condition or its own internal activity from a view from nowhere. Every condition enters an organization already shaped by biological history, learning, conditioning, present physiology, prior injury and relief, retained memory, and available patterns of response. Organism-relative differentiation is therefore unavoidable. [22–24, 56, 57, 96, 100, 101]

Evaluation in this sense does not require an explicit cognitive judgement. The organism does not first have to think, "this is good," "this is bad," or "this is dangerous." A condition can acquire differential significance through the organism's existing organization before any verbal or reflective judgement occurs. It may be registered as relevant or irrelevant, favourable or unfavourable, threatening or safe, familiar or unfamiliar, resolved or unresolved, requiring response or requiring none. [23, 24, 94, 101, 122–125]

The physical event and its causal properties remain real. What does not reside within the event as an observer-independent property is its complete organism-relative significance. A remark does not contain humiliation within its acoustic structure. A remembered event does not intrinsically contain psychological injury. A possible future does not carry fear within itself. These relations arise through the interaction between the condition and the organism's accumulated organization.

Yet the organism does not ordinarily encounter that entire causal relation as a transparent sequence. It does not experience, "This condition has acquired threatening significance because it is presently being differentiated through my biological history, conditioning, current state, learned associations, and prior experience." It encounters the completed differentiation more immediately as, "This is threatening."

The contribution of the organism's own organization is therefore already concealed within the result of the differentiation. The significance appears to belong to the condition, while the relation through which that significance was generated is not simultaneously represented.

Concealment does not therefore require a second mechanism that subsequently hides the evaluative process. The organization does not first generate a differentiated experience and then conceal how it was generated. The form taken by the completed differentiation is already what conceals its production.

The elementary movement can be stated schematically:

condition + organism-relative organization -> differential significance

Yet the completed result is encountered more nearly as:

significant condition

The relational organization through which the significance arose recedes behind its own product.

With the development of memory-dependent recursive cognition, this same architectural principle becomes more elaborate. The evaluated condition, the biological response it recruits, and the cognitive representation generated around it can become indexed to the historically maintained virtual reference point as, “This is happening to me.” The organism-relative pole of the original relation is now represented in psychological form as an apparent centre. What began as an unavoidable relation between a bounded organism and a condition can therefore become organized as an apparent division between “me” and “what is happening to me.” [5–10, 69, 147, 195]

A further recursive movement can then produce an apparent evaluator standing in relation to the evaluated content. The resulting state may become cognitively represented as, “I am afraid,” while memory and comparison may then generate a further evaluative representation: “I should not be afraid.” The second representation appears to introduce another position—an evaluator that stands outside fear and judges, resists, controls, or attempts to alter it. [5–10, 68, 69, 116, 147, 149, 202]

But the evaluator has not entered from outside the movement.

Its judgement may arise through retained memory, learned standards, comparison, the desire for security, anticipated consequences, previous experiences of fear, an image of how one should behave, resistance to the present state, or projection of a preferred future. The evaluator-response is therefore generated through the same conditioned organization within which fear has acquired its psychological significance. [6, 7, 56, 57, 68, 100, 116, 149, 202]

Consider the movement more closely. A condition is differentially organized as threatening. That significance may recruit a real biological transition. The resulting state may become cognitively represented as “I am afraid.” Memory and comparison may then generate the further representation “I should not be afraid.” An apparent psychological division now exists between the fear being evaluated and the “I” represented as evaluating it.

But the apparent evaluator is itself composed of conditioned relations: memory, comparison, judgement, resistance, learned expectation, desire for security, and projected outcome. These are not outside the fearful organization. They are further developments within it.

The apparent evaluator is therefore not merely another conditioned entity observing fear. It is the evaluated movement represented in an evaluative position.

In this precise architectural sense, the evaluator is the evaluated.

The same relation can appear through shame, anger, insecurity, desire, psychological injury, comparison, ambition, attachment, or attempted self-control. Thought may generate the psychological condition judged deficient, the standard against which it is measured, the apparent individual to whom the deficiency belongs, and the evaluator that attempts to correct it. [6, 7, 56, 57, 69, 100, 116, 147, 202]

Because these formations occupy different functional positions within cognition, they can appear to be separate realities confronting one another. The underlying organization may be one conditioned recursive movement, while the apparent organization takes the form of problem and problem-solver, fear and controller of fear, desire and judge of desire, insecurity and seeker of security, or, more generally, evaluated and evaluator.

The apparent separation conceals the causal continuity through which both sides were produced.

This is why the evaluator–evaluated division is not merely an additional consequence of concealment. It is an elaborated form of concealment itself.

The movement can be represented more fully as:

external or internal condition
-> condition enters a bounded organism already shaped by biological and psychological history
-> organism-relative differentiation generates significance
-> the significance is encountered primarily in the completed condition rather than together with the full organization that generated it
-> the relational origin of significance is concealed
-> a biological state transition or change in cognitive availability may occur
-> representation or thought arises
-> the condition, significance, feeling, or thought is indexed to the established virtual reference point as happening to “me”
-> the organism-relative relation is recursively represented as a division between “me” and what is happening to “me”
-> memory, comparison, fear, desire, learned standards, resistance, and projected outcomes generate an evaluator-response
-> that response is represented as the act of an independent evaluator standing outside the evaluated condition
-> the evaluator is itself another formation of the evaluated organization
-> the apparent division conceals the single causal movement through which both sides were generated
-> the evaluator’s response becomes new present content capable of further evaluation

-> the division and its concealment can renew themselves recursively

The apparent sequence is therefore:

something is threatening, insulting, undesirable, or incomplete -> I recognize that fact -> I evaluate what it means for me -> I decide how I should respond

The proposed causal sequence is different:

condition encounters accumulated organism-relative organization -> conditioned differentiation generates significance -> significance recruits biological and cognitive consequences -> those consequences are recursively indexed to the virtual reference point -> an apparent evaluator is generated within the same movement -> the resulting organization is represented as though an independently existing evaluator were confronting an independently meaningful condition

The apparent subject and apparent object of psychological evaluation therefore conceal the relational process through which their psychological significance and apparent separation were produced.

This does not imply that the organism is identical to an external physical object or that real distinctions between organism and environment disappear. An external event may remain physically distinct from the organism and may have real causal consequences. The claim concerns the internally generated psychological organization through which organism-relative significance, ownership, judgement, resistance, and control are represented.

The essential distinction is therefore between physical difference and psychological division. Physical difference between organism and environment is real, and organism-relative differentiation is biologically unavoidable. The false psychological division is the recursive elaboration through which the products of that differentiation are represented as though an independent psychological evaluator stood outside the conditioned organization and evaluated a significance existing independently within the condition.

But the evaluator and the psychological significance attributed to what is evaluated arise within the same movement.

The concealment can therefore be stated in its most compressed form:

One organism-relative movement generates the significance, the evaluated psychological content, and the apparent evaluator. The organization then presents these products as though an independent evaluator were confronting an independently meaningful condition.

The evaluator–evaluated division does not merely accompany concealment. It is an elaborated form of a concealment already implicit in organism-relative differentiation itself.

The division is the concealment.

Reward, just as punishment, does not constitute a separate evaluative mechanism within this architecture. Both are organism-relative differentiations produced through the same conditioned organization. An event may have real beneficial or harmful consequences, but its acquired status as rewarding, punishing, desirable, threatening, successful, or deficient is registered through the organism's biological history, learning, conditioning, and present state. Repeated reward and punishment therefore modify the organization through which subsequent conditions are evaluated; they do not introduce an evaluator standing outside that organization. [94, 101, 203]

At its most primitive, the initiating movement can be compressed as:

Event -> judgement-> division/concealment

Valence appears to belong to the event

Put more simply, the division and concealment occur when the value generated through the organism's relation to the event appears to belong to the event itself.
More precisely, the division and concealment occur when organism-relative value is encountered as though it belonged intrinsically to the event, while the organism–event relation through which that value was generated remains concealed.

The organism generates value in relation to the event → the completed value appears to belong to the event → this is the division → the relation that generated the value disappears from the apparent structure → this is the concealment.

The evaluator is the evaluated.

A further consequence follows directly from this architecture. Because the evaluator–evaluated division depends upon concealment of the organism-relative relation through which value is generated, a presently operating division cannot remain structurally intact when that relation becomes evident. In a particular episode of psychological conflict, exposure of the concealed relation therefore removes the division sustaining that conflict. No additional act of choice, suppression, acceptance, or control is required. The division may subsequently be regenerated through renewed judgement, but this constitutes a new iteration of the mechanism rather than persistence of the exposed division.

This circumstantial dissolution should not be confused with the more extensive reorganization developed as Insight; it establishes only that an individual instance of division cannot remain concealed once its generating relation is directly evident.

Each subsequent episode of psychological pleasure or psychological pain can reinforce the same organization. The event is again encountered as though its positive or negative significance belonged to it independently, while the conditioned relation through which that significance was generated remains concealed. Reward and punishment therefore do more than modify future

behaviour: through repeated organism-relative evaluation, they can strengthen the very movement that generates psychological division and obscures its own causal origin. In this way, the organization capable of producing psychological suffering also participates in conditioning its own continuation. [94, 101, 203]

> *Judgement generates the division.*
> *The division conceals the relational origin of the judgement.*
> *Repetition conditions the judgement.*
> *The concealed movement therefore reinforces its own continuation.*

15.14.3 Thought Does Not Exist Merely to Produce Another Thought

The architecture does not claim that the function of each individual cognitive event is merely to generate the next thought. Cognition frequently unfolds recursively, but a particular thought may assess a present condition, retrieve relevant knowledge, calculate, design, compare possible actions, guide movement, communicate, solve a problem, or prepare for a reasonably anticipated requirement. It may terminate in action, correction, learning, communication, or practical resolution rather than in another thought. [68, 97–99, 102, 203]

Further cognition is therefore one possible consequence of thought, not its sole purpose or inevitable result. What matters is what the representational content does within the organism's next present condition. A practical thought may be constrained by an independently existing relation and terminate when that relation is resolved. A measurement is obtained, a joint fits, a route is identified, a message is delivered, or an immediate requirement is met. The external or practical relation supplies a stopping condition. [68, 97–99, 102, 203]

Because practical and unnecessary cognition are both memory-dependent and operate through psychological time, their distinction does not lie in whether representation or projection is present. It lies in organization and termination. Practical cognition is constrained by a present condition capable of material update or resolution. Unnecessary cognition continues when internally generated representation supplies fresh evaluative conditions after no unresolved practical, organismic, or environmental requirement remains. [68, 97–99, 201]

15.14.4 Thought Becomes a New Present Stimulus

Once cognitive thought has arisen, it is not merely a passive description of a condition. Its representational content functions as a new present internal stimulus. The past does not return as the original event; it is reconstructed as a present representation. The future does not yet exist as the represented event; it is predicted, desired, feared, or simulated as a present representation. The represented object may therefore be absent, past, future, or wholly imagined while the cognitive operation and any recruited biological transition are real present processes. [9, 10, 114, 115, 201]

A comforting memory can function as a present internal stimulus and, through the organism's conditioned evaluative organization, may recruit a biological transition associated with comfort, relaxation, or bodily ease even though the remembered situation is not occurring again. An imagined criticism can function as a present internal stimulus and may recruit tension or defensive activation even though no criticism is presently occurring. A projected success may function as a present internal stimulus and may recruit anticipation even though the projected event has not occurred. [9, 10, 12, 13, 114, 115]

The representation thereby becomes part of the organism's current condition. The resulting biological transition, together with the representational content, becomes available to the next evaluative movement.

The recurrent sequence is:

> conditioned evaluation recruits thought -> representational content functions as a present internal stimulus -> through conditioned evaluation, that stimulus may recruit or modify a biological state transition -> the altered state and thought-content become fresh present conditions -> those conditions are evaluated -> action, resolution, memory updating, or further thought may follow

Another external event is not required for cognition to continue. Thought can produce fresh internal stimuli through its own representations. The organism then encounters those stimuli through the same history-dependent evaluative organization that recruited the preceding thought. [9, 10, 97–99, 114, 115, 201]

Continuation is not inevitable. A representation may fail to recruit further cognition, may be superseded by a more immediate condition requiring cognitive response, or may terminate in action or resolution. The claim is that thought's own products can function as effective present stimuli and therefore provide material from which cognitive continuity may be generated. [68, 97–99, 102, 201]

15.14.5 Historical Selfhood, Ongoing Recruitment, and Reversed Authorship

Sections 15.7 through 15.9 derived the virtual self in detail. The present architecture requires only the connection between that derivation and the generation of thought. The virtual reference point is not created in full by each cognitive event. Across development, memory, language, ownership, comparison, evaluation, fear, desire, social conditioning, autobiographical organization, and repeated indexing progressively author a psychological centre represented as "I," "me," and "mine." [5–10, 69, 72, 147, 195]

While this causal organization remains unperceived, the established virtual reference point remains the standing interpretive centre through which newly arising cognition is indexed. Present cognition recruits, updates, and maintains this virtual reference point. A thought, memory, evaluation, bodily reaction, intention, or action is organized as "my thought," "my memory," "my

fear," "my judgment," or "my decision." The cognitive and biological operations are then retrospectively attributed to that reference point as though it had existed prior to and independently of the movement. [5–10, 20, 69, 72, 147, 195–199]

The causal order is:

> historical thought, memory, language, ownership, and repeated indexing -> virtual reference point -> present cognition recruits and updates that reference point -> cognitive activity is attributed back to it as the act of an independent thinker and evaluator

The historical movement of thought has therefore authored the apparent evaluator; present cognition then recruits that established evaluator and attributes authorship of thought back to it. The self does not stand outside the generative sequence and decide which thought will appear. Thought arises through conditioned evaluative organization; the established virtual self is recruited within that same organization; and authorship is attributed retrospectively. [20, 195–199]

This reversal explains why the generative organization is ordinarily concealed. The apparent experience is "I was already here, and now I am examining my thought." The proposed causal movement is the opposite: the apparent observer is a historically formed and presently maintained position generated within the movement it appears to observe and control.

Across psychological time, thought generates the apparent observer. Within present cognition, the same movement produces the observed content, the apparent problem, the value assigned to the problem, and the imagined future resolution.

There is no genuinely independent psychological subject standing outside the movement. The observer is thought represented as an observer, and what it observes is another formation of thought. It is a process recursively encountering its own products while mistaking the internal division for a relation between two independent realities.

15.14.6 Why Practical Cognition Can End and Unnecessary Cognition Can Renew Itself

Practical and unnecessary cognition can employ the same capacities: memory, comparison, imagery, language, prediction, simulation, and evaluation. Their difference lies not in separate mental substances but in the organization of recruitment and termination. [68, 97–99, 102, 201]

A particular episode of practical cognition is constrained by a present relation that can be materially updated or resolved:

> present discrepancy -> cognition recruited -> relevant representation, comparison, planning, or action -> consequence registered -> discrepancy resolves -> that cognitive episode terminates [68, 97–99, 102, 203]

A material discrepancy can be altered or resolved by an independently existing condition. A self-referential psychological discrepancy is different. The inadequate present self, feared future, remembered injury, desired identity, or promised completion exists as a representation generated through psychological time. The same movement produces the apparent problem, the evaluator responsible for resolving it, and the imagined future in which resolution will supposedly occur.

Because no external material condition supplies a final terminating criterion for a discrepancy that thought continually reconstructs, external events may temporarily modify the content without permanently resolving the organization. The process attempting to solve the problem is also the process recreating it. Each apparent resolution can therefore become new material for evaluation.

A material problem can be terminated by a material relation. A psychologically constructed conceptual problem cannot be permanently resolved through the same recursive movement that continues constructing it.

The ending consequently becomes another beginning. A represented problem functions as a present stimulus; through conditioned evaluation it may recruit a biological transition; the altered condition is evaluated; the standing virtual evaluator is recruited; and another cognitive movement may appear necessary. Persistent chatter is therefore not explained merely by an excess number of isolated thoughts or by a separate person repeatedly choosing to think. It is the recurrent consequence of an organization that generates fresh internal stimuli, assigns them psychological significance, and preserves the appearance of an evaluator responsible for resolving conditions produced within the same movement. [9, 10, 56, 57, 114, 115, 201]

The complete movement can be represented as follows:

> condition or state -> conditioned evaluation -> biological transition or altered recruitment conditions -> memory, recognition, comparison, imagery, language, prediction, projection, simulation, or planning -> cognitive thought -> representational content functions as a new present stimulus -> through evaluation, a further biological transition may be recruited -> altered state and representation become fresh evaluated conditions -> action, resolution, or further cognition -> established virtual reference point recruited and updated -> activity attributed to that reference point as its independent act

Where an independently existing practical condition supplies resolution, the movement can terminate. Where thought itself produces the apparent observer, problem, value, discrepancy, and projected solution, no independent psychological endpoint is guaranteed. The sought resolution remains conceptual because it has been generated through psychological time, while the same movement continues to reconstruct both the discrepancy and the entity presumed to resolve it.

15.14.7 Concealment, Insight, and the Next Derivation

The same architecture proposes both generation and concealment. Conditioned evaluation recruits thought. Representational content then functions as a present internal stimulus and, through further evaluation, may recruit a biological transition. Across development, thought authors the virtual evaluator. During present cognition, that established evaluator is recruited and

represented as the independent source of evaluation. The movement therefore appears to be controlled from outside even though the apparent controller is one of its products.

This section has derived the organization through which thought is generated and can become self-renewing. It has not yet derived the specific Insight through which that organization becomes directly evident and loses governing viability. The next section applies the general mechanism of Insight to the conditioned continuity established here.

Direct perception cannot be another evaluator concluding that thought should stop. Such a conclusion would reinstate the same controller, comparison, and projected result. The relevant perception must encompass the full causal movement: condition, evaluation, representation, biological transition, apparent observer, assigned significance, discrepancy, and projected resolution are one conditioned organization.

Perception makes this causal relation directly evident. The relation is not entertained as a tentative interpretation or retained as another proposition; within the perceptual event it stands as categorical fact. Because the previous organization depends upon the apparent separation of observer and observed, evaluator and evaluated, problem and resolver, the evident relation functions as an immovable constraint. The organization cannot coherently retain the assumption on which it depended once that assumption has become directly contradicted by what is perceived.

When the full causal relation becomes directly evident, perception constrains the governing organization through negation. The movement loses viability, and unnecessary thought subsequently fails to acquire recursive continuation. This occurs not because a controller suppresses thought, but because the organization that made continued evaluation appear necessary can no longer coherently govern.

Thought may still arise when attention loosens. It may serve work, memory, communication, design, calculation, planning, and practical action. A conditioned representation may also function momentarily as a present stimulus and recruit a biological transition. The unresolved question for the next section is whether an arising thought automatically regains the former organization of evaluative necessity and recruits another thought, or whether it can terminate without suppression when no present requirement supports continuation. [68, 97–99, 102, 203]

In ordinary language, the architecture can be stated this way:

> *A living organism never meets anything from nowhere. What happens is encountered through everything the organism has already lived, learned, remembered, and become. That conditioned evaluation can recruit thought. Once thought appears, its content becomes a present internal stimulus that may, through further evaluation, recruit a biological transition. The changed condition can then become something else for the organism to evaluate, so the process can feed itself without another event occurring outside. Over time, thought, memory, language, ownership, and evaluation build the sense of a separate thinker. While that causal organization remains concealed, subsequent thoughts are indexed to and maintain the established "me," while being credited back to it as their independent author. The process generates the thought, the apparent thinker, the problem, and the imagined solution while failing to recognize that all belong to one movement.*

The next section examines what becomes evident when the target is not only the virtual self, but the organization through which cognitive thought repeatedly turns its own representational products into fresh conditions for further thought.

15.15 Insight into the Conditioned Continuity of Cognition

Section 15.14 derived the proposed organization through which cognitive thought arises and can become self-renewing. A bounded organism has no neutral computational standpoint; cognitive thought is memory-dependent and operates through psychological time; conditioned evaluation recruits representational cognition; and the resulting content can function as a present internal stimulus that, through further evaluation, may recruit a biological transition. The altered condition and representation can then become fresh material for action, resolution, or further thought.

The present section does not repeat that derivation. It applies the general mechanism of Insight to the organization already established. The target is not a deeper or higher form of Insight. The mechanism remains unchanged: a causal relation becomes directly evident, the evident fact proves incompatible with an assumption required by the governing organization, and that organization is constrained through negation. What changes is the organization brought into perception.

Insight into the self-generating movement concerns the historical authorship and present maintenance of the virtual reference point experienced as thinker, observer, evaluator, controller, owner, seeker, and sufferer. Insight into conditioned cognitive continuity concerns the organization through which internally generated representational content repeatedly acquires sufficient evaluative relevance to recruit further cognition after no present practical, organismic, or environmental requirement remains unresolved. These are distinct targets of one mechanism, not levels or grades of Insight.

15.15.1 The Remaining Causal Problem

As derived in Section 15.14, thought biologically precedes the virtual self to which thought is later attributed. The established virtual reference point can intensify, appropriate, and narrate cognition, but it is not the original engine from which memory, imagery, comparison, prediction, simulation, language, or association arise. [20, 195–199]

This ordering leaves a distinct causal problem. Direct perception that the self is virtual may constrain psychological ownership, self-security, observer-observed and evaluator-evaluated division, psychological becoming, self-defensive narration, and self-referential suffering. It does not by itself explain why the still-available capacities of cognition would cease recruiting one another. A visual image may recruit another image; a word may evoke an association; a bodily sensation may recruit an

interpretation; an unfinished pattern may recruit comparison; and a remembered event may generate projected outcomes without explicit use of the representation "I" at every transition. [9, 10, 97–99, 114, 115, 201]

The question is therefore not why cognition ever occurs. Cognition remains necessary where direct perception and automatic biological response are insufficient for adaptation. The narrower question is why an internally generated representation can continue to recruit further cognition after no independently resolvable condition requires continuation.

15.15.2 Automatic Recursive Relevance

The candidate mechanism proposed here is automatic recursive relevance. The term refers to the generated evaluative weighting through which internally produced content becomes sufficient to recruit another cognitive operation. It does not mean that relevance is intrinsic to a representation or that an inner evaluator consciously assigns it.

Section 15.14 established the recurrent architecture: representational content functions as a present internal stimulus; through conditioned evaluation it may recruit a biological transition or alter cognitive availability; the altered condition and representation become fresh present conditions; and memory, comparison, prediction, projection, imagery, or language may then be recruited. Automatic recursive relevance names the transition through which this internally generated content acquires sufficient significance for the sequence to continue without a new external event.

The candidate sequence is:

> internally generated representation -> generated evaluative relevance as discrepancy, possibility, incompleteness, anticipated loss or gain, or unresolved relation -> through conditioned evaluation, biological state or cognitive availability may change -> memory, comparison, prediction, projection, imagery, or language is recruited -> new representation -> renewed evaluative relevance -> further cognition

A remembered conversation may recruit an imagined reply. The reply may activate another response, a related memory, or a projected conflict. Through conditioned evaluation, the projected conflict may recruit defensive readiness, and the altered condition may increase the availability of further conflict-related representation. No independent thinker is required to select the next thought. [9, 10, 56, 57, 114, 115, 201]

The same structure can support creativity, learning, memory integration, exploratory simulation, and preparation for later action. The relevant distinction is therefore not between externally triggered and internally generated thought, nor between content judged useful and useless by an inner authority. It concerns whether cognition remains coupled to a present condition capable of update or resolution, or is prolonged primarily because each internal product generates fresh conditions for further recruitment. [98, 99, 201]

15.15.3 Relevance Without an Independent Evaluator

The language of relevance can smuggle in an evaluator who inspects a thought and authorizes continuation. The architecture requires no such centre. Relevance is expressed in the transition itself: representational content interacts with retained biological organization; through conditioned evaluation, state and cognitive availability may change; related memory, imagery, comparison, or prediction becomes more probable; and further thought follows. [97–99, 114, 115, 201]

The sequence is therefore not:

> independent evaluator judges thought relevant -> evaluator permits continuation

It is:

> thought appears -> representational content functions as a present stimulus -> content is encountered through retained conditioning -> through evaluation, biological state or cognitive availability may change -> related cognition becomes more probable -> further thought occurs

The narrator may later claim, "I considered that thought important" or "I decided to continue thinking about it," although recruitment may already have occurred before authorship was attributed. The problem is therefore not that a self repeatedly makes poor choices about which thoughts deserve attention. It is that conditioned organization can allow internally generated content to renew the conditions for its own continuation. [20, 195–199]

15.15.4 Material Resolution and Conceptual Re-creation

The difference between practical resolution and unnecessary continuation becomes clearest at the terminating condition. A material discrepancy can be altered by an independently existing relation. A measurement can be obtained, a structure repaired, a route identified, an obligation completed, or new evidence acquired. The relation changes, the discrepancy ends, and the particular cognitive episode can terminate. [68, 97–99, 102, 203]

A self-referential psychological discrepancy is organized differently. The inadequate present self, feared future, remembered injury, desired identity, threatened reputation, or promised completion exists as representation generated through psychological time. The same movement produces the apparent problem, the evaluator responsible for resolving it, and the imagined future in which resolution will supposedly occur.

External events may temporarily alter the content without terminating the organization. Praise may quiet insecurity, reassurance may interrupt fear, and achievement may produce temporary completion. Yet the process attempting to solve the problem is also the process reconstructing it. Each apparent resolution can therefore become new material for evaluation: Will it last? Could the injury recur? What does the outcome mean about me? Have I finally become secure? [56, 57, 116]

A material problem can be terminated by a material relation. A psychologically constructed conceptual problem cannot be permanently resolved through the same recursive movement that continues constructing it.

A simple example makes the distinction concrete. Suppose an organism represents its present psychological condition as unhappy and generates the idea that it must become happy. The present condition is then compared with a projected future condition represented as happiness. That projected happiness is not an independently existing state presently available for resolution. It is a representation constructed through accumulated memory, conditioning, comparison, prior pleasure and pain, expectation, social learning, and the organism's present biological and psychological state. Thought therefore generates both the apparent present deficiency — "I am not happy" — and the imagined future condition in which that deficiency is expected to disappear. [9, 10, 98, 100, 114, 115]

The projected endpoint is illusory in a precise sense. This does not mean that pleasure, fulfillment, contentment, or other present affective states cannot occur. It means that the imagined psychological condition in which the apparent self will finally become happy exists only as a present representation generated through thought. There is no independently existing future condition called "happiness" against which the conceptual discrepancy can finally be resolved.

What the organism presently represents as happiness may be security, recognition, relationship, achievement, material success, belonging, freedom from anxiety, or some imagined internal state. Because this representation is generated through conditioned evaluation, it can change as circumstances, memory, physiology, relationships, and present conditions change. What appears today to be the condition that will finally produce happiness may no longer appear sufficient tomorrow. An unexpected loss, injury, success, relationship change, or other major event may reorganize the evaluative field entirely, and the representation of what would constitute happiness may change with it. The projected endpoint therefore has no independently fixed terminating criterion. [9, 10, 23, 24, 61, 98, 100]

The movement can consequently renew itself without reaching material completion. Present dissatisfaction generates an image of future happiness; that image establishes a discrepancy between what "I am" and what "I should become"; the discrepancy recruits evaluation, comparison, projection, and further thought; and the resulting representations become new present conditions from which happiness is again evaluated. Even an imagined future in which happiness has supposedly been achieved remains a present representation capable of further evaluation: whether the imagined condition would be sufficient, whether it could be maintained, or what else might then be required.

Thought is therefore not merely attempting to reach a pre-existing psychological destination. It continually generates the conceptual destination, the distance from it, and the apparent self represented as travelling between the two. The movement attempting to resolve psychological incompleteness is simultaneously reconstructing the incompleteness, the entity said to possess it, and the conceptual future in which resolution is imagined to occur.

This is a central source of persistent cognitive continuity. Thought generates a conceptual discrepancy, the apparent controller who must resolve it, and the projected future in which resolution will occur. The movement then treats its own products as independently existing psychological conditions requiring further thought, while failing to recognize that the problem, problem-holder, evaluative significance, and imagined solution have been authored within one process.

15.15.5 What Becomes Directly Evident

The relevant perception is not the proposition that thought is conditioned and not detached observation of one isolated thought. The target is the full recruitment movement derived in Section 15.14: a representation arises; it functions as a present internal stimulus; through conditioned evaluation it may recruit a biological transition or change in cognitive availability; further representation is recruited; and no present independently resolvable requirement is being served by continuation.

The movement becomes directly evident as one conditioned organization. The apparent observer is generated within thought; the observed psychological content is another formation of thought; assigned significance is generated within the same movement; the biological response may be recruited by thought's representational stimulus; and the projected resolution is another thought-produced representation.

What becomes evident also includes the absence of an external terminating condition. No practical discrepancy remains unresolved; no action is presently possible or required; no new information is being obtained; and no material relation can complete the conceptual movement thought continues to construct. Continuation is not condemned as wrong and is not classified by an inner monitor as useless. Its conditioned and self-renewing structure becomes evident.

Within the perceptual event, the causal order stands as categorical fact rather than as a tentative interpretation to be weighed by the virtual evaluator. The observer, evaluated content, assigned significance, biological transition, conceptual discrepancy, and projected resolution are one movement. The fact therefore functions as an immovable constraint upon the assumption that a separate evaluator stands outside the movement and must continue resolving it.

15.15.6 Constraint Through Negation Applied to Recruitment

Before perception, the governing organization operates as though the appearance of cognitive content warrants continued evaluation. This rule need not be verbal. It is embodied in the transition from representation to renewed recruitment.

Direct perception exposes the incompatible relation: cognitive content has arisen, but its appearance does not constitute an independent problem, no present condition requires further cognition, and the apparent evaluator, represented discrepancy, and sought resolution are products of the same conditioned movement.

The proposed sequence is:

> **full causal movement becomes directly evident -> the evident relation categorically contradicts the assumed independence of observer, problem, and resolver -> perception constrains the governing organization through negation -> automatic recursive relevance loses authority -> unnecessary content fails to acquire recursive continuation**

The organization loses viability not because a controller decides that thought should stop, but because the relation upon which continued evaluation depended can no longer coherently govern once its contradiction has become directly evident. Perception does not apply a rule to thought. The perceived fact itself is the constraint.

The underlying biological history need not be erased. A conditioned thought, bodily cue, verbal fragment, or familiar association may still arise through retained pathways. The prediction concerns trajectory: whether the arising content recruits the former extended movement. [94, 96, 101, 203]

15.15.7 Before and After Reorganization

Before reorganization, a representation can function as a present stimulus, recruit a biological transition through conditioned evaluation, and thereby appear to validate its own significance. A projected threat recruits tension; the tension is interpreted as evidence that the threat matters; further threat-related memory and prediction become available; and the cognitive trajectory becomes self-confirming. [12, 13, 21, 56, 57, 114, 115, 119]

After the recruitment organization has been constrained, an unnecessary thought may still arise and may momentarily recruit a biological response. Where no present practical, organismic, or environmental requirement supports continuation, however, the former chain of autobiographical elaboration, comparison, prediction, and projection is not recruited. The thought terminates without opposition.

> **Suppression: thought arises -> it is judged unacceptable -> an apparent controller opposes it -> monitoring and comparison continue -> the thought remains relevant as an object of control -> conflict sustains cognition [68, 116, 149, 202]**

> **Dissolution: thought arises -> no present requirement supports continuation -> no recursive amplification is recruited -> no further thought follows -> silence returns**

No chooser rejects the thought, no controller suppresses it, and no evaluator measures whether termination has occurred. The former organization simply fails to secure the conditions required for further recruitment.

15.15.8 Residual Pathways, Practical Cognition, and Empirical Trajectory

Residual pathways remain compatible with the account. A social cue may recruit an old defensive thought; a bodily sensation may evoke a prior health concern; a memory may briefly reconstruct an injury; or an unfinished verbal fragment may enter awareness. Before extensive constraint, such content may recruit autonomic amplification, autobiographical elaboration, anticipatory projection, and a prolonged chain. After extensive constraint, the same content may produce only brief activation and little or no recursive gain. [12, 13, 21, 56, 57, 101, 114, 115, 119]

Empirical assessment should therefore examine trajectory rather than demand absolute absence of thought: whether one thought recruits another, how long the chain persists, whether autobiographical memory and future projection develop, whether biological amplification follows, whether the virtual reference point regains authority as owner and controller, and how rapidly present awareness returns without effort.

Constraint of automatic recursive relevance does not eliminate cognition. A present practical, organismic, or environmental requirement can recruit memory, comparison, prediction, simulation, language, and planning for as long as the condition remains unresolved. Duration is not decisive. Designing a structure, conducting scientific work, or navigating a difficult conversation may require sustained cognition without becoming unnecessary psychological occupation. [68, 97–99, 102, 203]

The demand-responsive sequence is:

> **present independently resolvable requirement -> cognition recruited -> relevant memory, comparison, planning, prediction, simulation, communication, or action -> consequence registered -> requirement resolves -> that cognitive episode terminates -> silence**

Practical and unnecessary thought do not use different biological media. Both are memory-dependent, representational, evaluative, and operate through psychological time. They differ in recruitment and termination. Practical cognition remains coupled to an independently resolvable condition. Unnecessary cognition renews itself through internally generated conceptual conditions whose apparent resolution is produced and reconstructed by the same movement.

15.15.9 Thought as an Intermittently Recruited Instrument

The predicted outcome is not permanent absence of thought. Thought remains biologically available but changes functional position. A requirement arises, cognition operates, the requirement resolves, cognition terminates, and present awareness remains without compulsory production of further content.

A capacity can be indispensable without operating continuously. Calculation need not be perpetual; language need not become uninterrupted internal speech; and the capacity to simulate possible futures need not produce continuous projection. No separate chooser decides when thought should occur. A present condition recruits the relevant capacity, and where no condition supports continuation, the former recursive movement is not reinstated. [97–99, 102, 201]

This Insight cannot be converted into a method of continuously evaluating whether each thought is necessary. An instruction such as "think only when thought is required" would recruit an internal monitor. Each thought would be classified, progress measured, and failure condemned. Judgment would become another thought, and supervision another recursive occupation. No one applies dissolution as a rule; the former recruitment organization has lost governing viability.

15.15.10 Complete Attention, Choiceless Awareness, and Scientific Status

Complete attention and Insight into conditioned continuity occupy distinct but related positions. Complete attention demonstrates that present awareness can remain while cognitive thought is absent. Insight into conditioned continuity addresses why unnecessary thought is repeatedly reinstated after attention loosens.

> **Temporary attention: thought absent -> silence -> recruitment organization remains viable -> attention loosens -> internally generated content acquires recursive relevance -> unnecessary thought resumes**
>
> **Insight into conditioned continuity: recruitment organization becomes directly evident and is constrained -> attention loosens -> an unnecessary thought may arise -> no recursive gain is recruited -> thought terminates -> silence returns without effort**

This distinction provides the bridge from temporary meditation to choiceless awareness. Meditation, in its immediate definition, is the silent interval in which psychological time is absent while present awareness remains. Choiceless awareness is the attention naturally available where unnecessary psychological time is no longer repeatedly reinstated. Silence is not produced or defended; it is present whenever cognition is not required.

Automatic recursive relevance remains a candidate mechanism derived from the architecture. Its biological implementation has not yet been established. The framework must therefore determine how generated evaluative relevance is instantiated across neural, metabolic, autonomic, and regulatory processes; which transition dynamics distinguish demand-responsive cognition from unnecessary continuation; how internally generated representations alter recruitment probability; and what measurable changes accompany loss of recursive gain.

The framework does not assume that every spontaneous thought lacks function. Spontaneous cognition may contribute to memory organization, creativity, exploratory simulation, or preparation not immediately recognized by the narrator. The narrower claim is that where cognition is repeatedly prolonged by internally generated representational content after no present independently resolvable requirement remains, its continuation is conditioned rather than intrinsically necessary. [98, 99, 201]

The predicted signature is selective rather than global: fewer unnecessary initiations, shorter spontaneous chains, lower transition probability from one non-demand-responsive thought to another, reduced autobiographical elaboration and anticipatory projection, less biological amplification, more rapid termination of residual thoughts, preserved task-relevant cognition, and naturally recurring silence. These predictions remain to be operationalized and tested.

15.15.11 Two Targets of One Mechanism

The relation between the two principal targets can now be stated precisely. Insight into the self-generating movement constrains the authority of the virtual reference point as an independent thinker, owner, evaluator, controller, seeker, and sufferer. Insight into conditioned cognitive continuity constrains the automatic recruitment through which internally generated content repeatedly acquires recursive gain after no present requirement supports continuation.

> **Self-generating movement: thought operating through psychological time -> historical recursive indexing, ownership, language, and autobiographical organization -> virtual reference point -> apparent independent thinker and owner. Direct perception of this causal order -> loss of authority of the virtual reference point as independent author.**
>
> **Conditioned cognitive continuity: thought -> representational content functions as a present internal stimulus -> through conditioned evaluation, biological transition or fresh cognitive availability may be recruited -> further thought -> continued psychological time. Direct perception of this full movement and the absence of an independently resolvable requirement -> automatic recursive relevance constrained -> unnecessary thought terminates.**

The mechanism remains the same in both cases: direct perception, categorical incompatibility with the governing organization, constraint through negation, and loss of authority. One target concerns production and maintenance of the apparent centre; the other concerns automatic continuation of the cognitive movement from which that centre arises.

Together, the two reorganizations yield a coherent architecture. Thought no longer retains an independently authoritative owner, and internally generated content no longer automatically recruits unnecessary continuation. Practical cognition remains available. When a present requirement arises, thought operates; when the requirement resolves, cognition terminates; and when no requirement exists, organism-relative awareness remains without compulsory psychological occupation.

The central conclusion is that cognitive continuity is conditioned rather than intrinsically necessary. When the organization through which internally generated content repeatedly produces fresh conditions for thought becomes directly evident and is constrained, thought remains biologically available, but unnecessary cognition fails to acquire recursive continuation. An arising thought may terminate without producing another, and silence may return without effort, suppression, or control. The next subsection derives choiceless awareness from this reorganization: not as a method, attained identity, or maintained state, but as the attention naturally available when thought is no longer unnecessarily reinstated through psychological time.

15.16 Choiceless Awareness as a Derived Consequence

Choiceless awareness can now be introduced without appealing to an unexplained contemplative faculty, spiritual principle, or observing consciousness situated outside biological organization. It follows from the architecture developed in the preceding subsections. Thought consists of accumulated knowledge and memory operating through psychological time. Through recursive organism-relative evaluation, this activity generates a virtual reference point subsequently represented as thinker, observer, evaluator, controller, owner, seeker, and sufferer. Internally generated cognitive products can also acquire sufficient organism-relative relevance to recruit further thought, allowing cognition to continue after no practical, organismic, or environmental requirement remains unresolved.

Complete attention demonstrates that this movement can cease while organism-relative phenomenology remains. Insight into the self-generating organization constrains the authority of the apparent psychological author, while insight into conditioned cognitive continuity constrains the automatic recruitment through which unnecessary thought repeatedly reinstates psychological time. Choiceless awareness is proposed as a consequence of these combined reorganizations, not as an additional faculty introduced to explain them.

Within this framework, choiceless awareness is ongoing organism-relative phenomenal presence in which thought remains biologically available but does not compulsively operate through psychological time. It is neither a separate witness left behind when thought ceases nor a state maintained by a psychologically purified controller. Its derivational form is:

> *present organism-relative phenomenology -> no actual requirement for cognition -> unnecessary thought receives no recursive gain -> psychological time is not reinstated -> present attention remains -> choiceless awareness.*

Thought is neither prohibited nor permanently removed. Memory, comparison, prediction, language, planning, and problem-solving remain available whenever an actual requirement recruits them. When the requirement resolves, cognition can terminate rather than converting its own products into further demand. Choiceless awareness therefore describes a change in the relation between present perception and cognition: the capacities of thought remain available without being continuously or unnecessarily reinstated. [68, 97–99, 102, 203]

15.16.1 Why Attention Arises Naturally

Before conditioned cognitive continuity has been constrained, attention can appear to require effort. A goal is remembered, cognition is redirected, competing content appears, distraction is detected, and corrective commands are generated. The apparent controller is repeatedly reconstructed in statements such as “I must remain attentive,” “I am losing the state,” or “I need to try harder.” Attention is thereby organized through memory, comparison, effort, and psychological time. [68, 149, 202]

Effort can temporarily narrow cognition or interrupt spontaneous continuation, but it does not necessarily alter the recruitment organization from which distraction repeatedly arises. Where automatic recursive relevance remains viable, one cognitive event continues to increase the probability of another, and correction must be renewed because the controlling intention is itself another event within cognition. [36, 43, 68, 149, 202]

Choiceless awareness follows a different organization. When unnecessary content no longer automatically receives recursive gain, a residual thought may arise without becoming a prolonged chain, and attention no longer depends upon repeated correction by an apparent controller. Nothing must remember to remain present, compare the present with an ideal state, suppress each thought, or defend silence against interruption. Where no actual cognitive requirement is present, organism-relative awareness remains without being manufactured.

The sequence is not that a self detects distraction, applies control, and returns itself to awareness. Rather:

> *no actual cognitive requirement is present -> unnecessary content receives no recursive continuation -> thought terminates -> present phenomenal registration remains.*

Attention is not added as a new activity. It becomes evident when unnecessary cognitive occupation is absent. Describing it as natural does not imply biological perfection, supernatural purity, or freedom from conditioning. It means only that present attention is not continuously produced through effortful opposition to thought and does not require an independent controller to maintain it.

15.16.2 Why the Condition Is Choiceless

The term “choiceless” does not mean that a self has decided not to choose, nor does it deny practical selection or decision-making. A living organism must discriminate among conditions, prioritize danger and bodily need, compare alternatives, and select actions. These are biological functions. The term concerns the absence of an independently existing psychological chooser imagined to stand outside those functions and author them. [23, 68, 148]

Thought generates intentions, preferences, commands, predictions, and behavioural preparations, after which those operations are attributed to an apparent chooser. The practical process is real; the additional interpretation of an autonomous entity standing outside it is unnecessary. Because the apparent chooser is generated within thought, it cannot independently control the process that generates it. An instruction such as "I will remain choicelessly aware" therefore contains a structural contradiction: the virtual reference point projects a future condition in which no chooser directs awareness, applies a method to attain it, and monitors progress through psychological time. [20, 195–199]

The chooser cannot achieve choicelessness through effort because effort reproduces the division the desired condition is supposed to end. Choiceless awareness is choiceless because no independently existing selector is required, not because a selector has chosen to withdraw. Direct perception constrains the organization producing the controller-controlled division, and insight into conditioned continuity constrains unnecessary recruitment. When no further thought is recruited, present awareness remains without an additional agent directing it.

Practical selection is preserved. A dangerous event can recruit immediate action, a problem can recruit comparison among possible solutions, and an organism can enact one response rather than another. Practical selection remains; what loses authority is the interpretation of an independent psychological chooser standing outside the biological process. [68, 148]

15.16.3 Awareness Without a Separate Witness

The claim that awareness remains must not be interpreted as positing a permanent, pure, or metaphysically independent consciousness beneath thought. Awareness refers here to ongoing organism-relative phenomenal presence: the inside-view manifestation of continuing biological integration and registration. It is not a second subject hidden behind the narrator.

When thought ceases, sensory registration, bodily feeling, spatial relation, affective tone, environmental responsiveness, and organism-relative phenomenology can remain. No additional witness must be inserted to own or observe those events. The narrator may later reconstruct the interval and report, "I was aware," but that report is generated after thought has returned. It does not establish that an independent psychological owner was present during the interval. The organism was phenomenally present; the virtual narrator was not required as owner of that presence.

Choiceless awareness should therefore not be described as the true self, pure consciousness as an independent substance, an eternal witness, hidden observer, or higher entity behind thought. Such descriptions merely relocate the explanatory problem. The present architecture permits no substitution of one observer for another. The observer is not replaced; the assumed requirement for an independent observer is removed.

15.16.4 The Restricted Meaning of Timeless Awareness

Choiceless awareness may also be described as timeless, provided the term is strictly limited. Physical time does not cease. Chronological succession continues, biological processes unfold, the environment changes, and the organism ages. Memory can retain past events, and practical thought can anticipate future conditions.

What is absent is psychological time: the movement through which retained past is reconstructed and projected toward an imagined psychological future around the virtual reference point. Its familiar organization is "what I was, what I am, and what I should become," or "what happened to me, what it means about me now, and what may happen to me later." When this movement is inactive, the present is not organized as a stage within a narrative of self-continuity and inward becoming.

Timeless awareness therefore means that the present is not occupied by the virtual self moving from reconstructed past toward projected psychological future. Chronological knowledge and practical projection remain. The organism can know that an appointment occurs tomorrow, that wood may move with seasonal humidity, or that an unfinished task requires later action. Such projections serve actual relations. What is absent is the psychological conversion of future time into promised completion or permanent security for the virtual self.

15.16.5 Meditation and Choiceless Awareness

Meditation was previously defined in its immediate structural sense as the silent interval in which thought operating through psychological time is absent while organism-relative awareness remains. A temporary meditative interval can occur without durable reorganization. Thought may cease and awareness remain while the prior recruitment organization later reactivates through memory, sensation, expectation, or internally generated representation.

Choiceless awareness refers to meditative attention that no longer depends upon temporary interruption, effortful concentration, environmental isolation, ritual, or repeated method. Where unnecessary psychological time is no longer automatically reinstated, silent awareness arises naturally whenever no actual cognitive demand is present. Meditation is the silent interval in which psychological time is absent while awareness remains; choiceless awareness is that meditative attention arising naturally because unnecessary psychological time is no longer compulsively reinstated.

A method may alter the conditions under which silence occurs. A quiet environment can reduce external demand, breathing practices can alter autonomic activity, concentration can narrow cognitive competition, and repetition can reduce the variety of spontaneous thought. These effects may be real and measurable, but they do not by themselves establish choiceless awareness. Where silence remains dependent upon repetition, effort, posture, withdrawal, monitoring, suppression, or the authority of a method, the prior recruitment architecture may remain viable. [36, 37, 43, 59, 149]

The decisive question is not whether the organism can become silent under controlled conditions, but whether silence arises naturally because unnecessary cognition no longer receives recursive gain. Meditation is not something an individual performs in

order to reach awareness. It is the awareness present when psychological time is absent. The method is not meditation; the silence is meditation. Where recruitment has been durably reorganized, meditation is no longer pursued as a future state but appears whenever thought is not practically required.

15.16.6 Temporary Silence and Reorganized Tendency

Not every silent interval should be classified as choiceless awareness. Thought may diminish or cease through complete attention, sensory absorption, concentration, fatigue, shock, reduced arousal, pharmacological alteration, sedation, dissociation, or other changes in biological state. These conditions can reduce cognitive activity without producing the recursive reorganization proposed here. [36, 38–40, 43, 46, 47, 59, 73–75, 149]

The defining issue is not merely whether thought is absent at one moment, but why it is absent, which biological capacities remain, and what happens when cognition again becomes available. The contrast is:

> *Temporary silence: present perception remains -> active thought ceases -> silence occurs -> prior recruitment architecture remains viable -> spontaneous cognition resumes.*
> *Choiceless awareness: unnecessary recruitment architecture has been constrained -> no actual cognitive requirement is present -> thought is not automatically reinstated -> present attention remains naturally -> cognition arises when relevant demand recruits it.*

The distinction is between a temporary state and a reorganized tendency. Temporary silence demonstrates that thought can cease. Choiceless awareness predicts that unnecessary thought no longer has the same probability of reinstatement and continuation. A profound silent interval can later be appropriated as memory, ownership, achievement, comparison, and future pursuit. The original interval may have been genuine; its appropriation reveals that the self-generating and recruitment organizations remain active.

Choiceless awareness is therefore not the memory of silence, the pursuit of silence, or identification with someone who has experienced silence. It is present awareness when psychological time is not unnecessarily operating.

15.16.7 Why Method Cannot Maintain It

Because choiceless awareness follows from reorganized recruitment conditions, continuous method cannot maintain it without contradiction. A method intended to preserve awareness requires the instruction to be remembered, present cognition to be monitored, the present compared with a desired state, deviation detected, correction applied, and future continuation projected. These are movements of thought operating through psychological time.

A method may produce concentration, behavioural discipline, or a temporary reduction in competing cognition. It cannot be identical to the absence of the movement through which the controller and method are generated. This does not imply that structured practice is useless. Practice may alter physiology and attention, reduce distraction, and make the instability of control visible. The narrower claim is architectural: method cannot be identical to choiceless awareness because choiceless awareness is present when the method-producing movement of psychological time is inactive. [36, 37, 43, 59, 68, 149]

Attempts to possess choiceless awareness as an achievement generate a new identity: “I am attentive,” “I am meditating,” “I have attained silence,” or “I understand choiceless awareness.” The virtual reference point then appropriates the consequence of its own attenuation. The content changes while the ownership structure remains. Choiceless awareness cannot become a possession without ceasing to be choiceless in the relevant sense. The organism may later describe what occurred, but retrospective description must not be confused with ownership by an independent subject.

15.16.8 Practical Cognition Remains Available

Choiceless awareness does not require uninterrupted literal silence in which no thought ever arises. Actual conditions recruit cognition. A question can recruit language and memory; a measurement can recruit comparison; a practical problem can recruit simulation; and a decision can recruit projection of relevant consequences. The functional sequence remains: [68, 97–99, 102, 203]

> *actual requirement -> cognition recruited -> relevant thought operates -> action or resolution -> requirement ends -> cognition terminates -> awareness remains.*

Choiceless awareness is therefore compatible with extended practical thought. A demanding task may require sustained memory, calculation, simulation, evaluation, and revision. The critical feature is that cognition remains coupled to the actual requirement. When the task ends, thought need not continue by evaluating what the result means about the self, how others will judge it, or how achievement can secure identity. The practical process can terminate without converting itself into psychological becoming. [68, 97–99, 102, 203]

The predicted change is not reduced cognitive capacity but reduced compulsory cognitive occupation. Reduced capacity would impair memory, planning, language, problem-solving, and adaptive response. Reduced compulsory occupation preserves those capacities while decreasing unnecessary initiation, elaboration, and continuation. Thought becomes available rather than dominant, functional rather than compulsory, and intermittently recruited according to demand rather than continuously self-recruiting. [68, 96–99, 102]

15.16.9 Primary Phenomenology Remains

Choiceless awareness preserves the distinction between L1 primary organism-relative phenomenology and the downstream recursive narrator. When thought is inactive, L1 does not disappear. The organism can register light, sound, movement, bodily sensation, affective tone, space, contact, and environmental relation. No narrator is required to convert those events into experience. The narrator can subsequently name, reconstruct, and claim them, but its absence during an interval does not imply absence of phenomenology.

> *The relevant relation is:*
> *L1 organism-relative phenomenology remains -> unnecessary L2 recursive occupation is absent -> present actuality is registered without continuous narrator-mediated appropriation.*

Choiceless awareness therefore predicts preserved, and potentially less obstructed, present registration rather than diminished consciousness. The organism is not blank, cognitively destroyed, or detached from the world. Awareness remains grounded in the living organism: the inside-view presence of an organism whose cognitive machinery remains available without being unnecessarily active.

15.16.10 What Choiceless Awareness Is Not

Choiceless awareness is not sedation or anesthesia, because those conditions may reduce arousal, responsiveness, memory, integration, or the biological conditions supporting reportable phenomenology. It is not dissociation, because it does not require detachment, fragmentation, altered reality experience, or impaired integration. It is not blankness, cognitive impairment, suppression of phenomenology, or inability to think. Memory, language, planning, skilled action, problem-solving, and social functioning remain available. [38–40, 46, 47, 73–75]

Nor is it indifference, passivity, freedom from biological vulnerability, or emotional numbness. The organism remains capable of care, concern, affection, grief, practical responsibility, and action. Pain, fear, illness, loss, sadness, joy, humour, and ordinary preference remain possible. Choiceless awareness is not a superior identity or an attainment possessed by a transformed self. The statement “I am a choicelessly aware person” can itself become another construction of the virtual reference point. [23, 27, 28, 205, 206]

The proposed condition is the absence of unnecessary psychological occupation where the self-generating and self-propagating organizations no longer possess their former authority. It must therefore be distinguished from states that globally diminish biological or cognitive availability.

15.16.11 Selective Recruitment Rather Than Global Suppression

The framework predicts selectivity. Where actual demand exists, thought, relevant memory, comparison, projection, and responsive action should remain available. Where no actual demand exists, unnecessary thought should arise less frequently, receive less recursive gain, recruit less autobiographical elaboration and future projection, and terminate more rapidly. The prediction is not less thought under every condition, but less unnecessary thought in the absence of actual demand, with preserved or potentially more efficient cognition where thought is required.

This selectivity distinguishes choiceless awareness from globally slowed or impaired states. A globally suppressed organism may display reduced thought together with diminished task performance, responsiveness, memory, or integration. Choiceless awareness predicts reduced compulsory occupation without corresponding loss of cognitive availability. The organism should move flexibly from silence into cognition when required and from completed cognition back into silence when the requirement ends. [38–40, 46, 47, 73–75]

> *The contrasting trajectories are:*
> *Demand-responsive organization: silence -> actual demand -> cognition -> resolution -> silence.*
> *Self-propagating organization: thought -> internally generated demand -> further thought -> renewed internally generated demand -> continued psychological time.*

Choiceless awareness is the naturally present condition made possible when the second organization has been extensively constrained.

15.16.12 A Derived Consequence Rather Than a Starting Assumption

Choiceless awareness belongs at the end of the derivation rather than at its beginning. Introduced prematurely, it could be mistaken for a spiritual ideal, metaphysical essence, meditative instruction, special state to be attained, or faculty possessed by a hidden observer. Derived from the architecture, it has a constrained meaning. Thought generates the apparent chooser; direct perception constrains that chooser’s authority; internally generated content ordinarily recruits continued cognition through automatic recursive relevance; and direct perception constrains that conditioned continuation. Where no actual demand exists, further thought is not recruited, organism-relative phenomenology remains, and no controller is required to maintain attention.

> *The complete derivation can be compressed as follows:*
> *accumulated knowledge and memory -> thought operating through psychological time -> recursive organism-relative evaluation -> virtual reference point -> apparent thinker, observer, evaluator, controller, and chooser -> internally generated content acquires recursive relevance -> further cognition is recruited -> psychological time continues.*
> *Insight into the self-generating organization -> virtual chooser loses authority as an independent agent.*
> *Insight into conditioned cognitive continuity -> unnecessary internally generated content loses recursive gain.*

No actual demand is present -> cognition terminates -> present organism-relative phenomenology remains -> attention arises without effortful control -> choiceless awareness.

Meditation follows within the same architecture. When thought operating through psychological time is absent, the interval is silent and awareness remains. Where silence is temporary and prior recruitment conditions remain unchanged, meditation ends when thought resumes. Where unnecessary recruitment has been extensively constrained, meditation is no longer pursued as a future state; it is the naturally recurring silence of choiceless awareness whenever cognition is not required. [36, 43, 59, 149]

The central proposition is therefore that choiceless awareness is ongoing organism-relative phenomenal presence in which thought remains biologically available but does not compulsively operate through psychological time. It is choiceless not because a self has chosen not to choose, but because no independently existing chooser is required to direct or maintain awareness. Actual demand recruits cognition, resolution terminates it, and silence returns without effort. Choiceless awareness is not diminished cognitive capacity. It is diminished compulsory cognitive occupation.

The next subsection examines the biological consequences and empirical predictions that follow from this derivation. It distinguishes conceptual knowledge, temporary attention, concentration, meditative silence, insight into the self-generating organization, insight into conditioned cognitive continuity, choiceless awareness, and global suppression according to their predicted effects on cognitive recruitment, practical performance, autonomic activity, metabolic demand, and the multidimensional Friction Signature.

15.16.13 Biological Consequences and Empirical Predictions

The preceding derivation creates explicit empirical obligations. Knowledge acquisition, complete attention, insight into the self-generating movement, insight into the conditioned continuity of cognition, and global cognitive suppression are proposed as structurally different events. They should therefore not be treated as biologically interchangeable merely because each can alter subjective report, reduce self-referential narration, or temporarily diminish the apparent continuity of thought.

The empirical program must distinguish these conditions by both target and mechanism. The relevant question is not simply whether a participant reports feeling peaceful, selfless, attentive, silent, or transformed. Similar descriptions can arise through concept acquisition, expectation, concentration, temporary absorption, pharmacological change, dissociation, social demand, behavioural training, or durable recursive reorganization. Verbal report is therefore informative but insufficient. It must be interpreted in relation to the organization that has changed, the conditions under which that organization is recruited again, and the biological trajectory that follows its reactivation. [36, 38–40, 46, 47, 59, 68, 73–75, 149, 200, 202, 203]

The stronger empirical question is consequently threefold: what organization has changed; how does the organism respond when that organization is recruited again; and what cognitive, autonomic, metabolic, and network-level trajectory accompanies the response? A claim of insight would be strengthened not by one exceptional state but by evidence that a previously governing organization repeatedly fails to recover its former authority across the contexts in which it had operated.

The framework therefore predicts distinguishable patterns across cognitive recruitment, transition probabilities, context-dependent reactivation, autobiographical continuation, behavioural response, autonomic regulation, metabolic demand, network coordination, longitudinal stability, and the multidimensional Friction Signature. These dimensions should not be interpreted as independent checkboxes. Their value lies in convergence: the same proposed reorganization should produce a coherent pattern across several levels of observation rather than an isolated change in one signal.

No single measure is expected to establish insight. A reduction in one neural or metabolic variable, a temporary increase in calm, one report of silence, or a brief decrease in self-referential thought cannot determine whether a governing recursive organization has become nonviable. The same observation may be produced by fatigue, concentration, suppression, altered arousal, expectancy, or reduced cognitive capacity. Evidence must therefore be both convergent and temporally structured.

The empirical unit is not merely a momentary state. It is the trajectory through which a prior organization is recruited, either regains authority or fails to do so, recruits or fails to recruit further cognition, produces or fails to produce organism-level amplification, and eventually terminates. The analysis must therefore follow the cognitive event through initiation, elaboration, bodily recruitment, behavioural expression, recovery, and later context-dependent reactivation.

The trajectory can be represented schematically:
recruiting event -> interpretation through the existing organization -> autobiographical ownership or its absence -> further cognitive recruitment or termination -> autonomic and metabolic amplification or attenuation -> behavioural response -> recovery -> later retest across changing contexts.

The most informative comparisons will therefore examine what initiates the event; how it is interpreted; whether autobiographical ownership is recruited; whether one thought produces another; whether psychological time develops; whether autonomic and metabolic activation is amplified; how long the resulting trajectory persists; whether effort is required to terminate it; whether the same organization returns under stress or changing conditions; and whether practical cognition remains intact. Preservation of task-relevant cognition is especially important because it distinguishes selective recursive reorganization from global suppression or impairment.

This approach also requires explicit comparison with plausible alternatives. Conceptual learning may change report while leaving recruitment unchanged. Concentration may temporarily reduce competing cognition while requiring continuing effort. Suppression may inhibit expression while preserving the underlying organization. Expectancy and social demand may alter description without producing durable change. Behavioural training may modify outward response without constraining

autobiographical ownership or recursive continuation. Global cognitive reduction may decrease thought together with memory, responsiveness, or task performance. Each alternative predicts a different temporal and multidimensional profile. [38–40, 68, 73–75, 149, 200, 202, 203]

The predictions developed below are theoretical consequences of the proposed architecture, not established empirical facts. Their scientific value depends upon whether the relevant constructs can be operationalized, measured longitudinally, and distinguished from competing explanations. The framework therefore commits itself to convergent evidence, preserved practical cognition, context-sensitive retesting, and falsifiable differences among temporary state change, learned regulation, suppression, and durable loss of governing authority.

15.17 Empirical Distinctions Between Knowledge Acquisition and Insight

15.17.1 Knowledge Acquisition Versus Insight

Knowledge acquisition and insight both require biological change. New information must be encoded, associations may be modified, memory may be updated, performance may improve, expectations may change, and future behaviour may be altered. The proposed distinction is therefore not that learning is biological while insight is somehow non-biological. Both occur through the living organism. The distinction concerns what is changed. [94, 96–99, 203]

Knowledge acquisition generally modifies content, association, skill, expectation, or performance within an organization that remains capable of governing subsequent experience. Insight, as defined in the present framework, changes the viability of the governing organization itself. Learning may add information that corrects, competes with, or redirects an established interpretation; insight renders the previously governing interpretation incapable of retaining its former authority. [94, 96–99, 203]

> *The contrast can be stated schematically:*
> *Knowledge acquisition: existing organization -> new information encountered -> content or association modified -> information incorporated -> governing organization remains available.*
> *Insight: existing organization -> direct perception of an incompatible relation -> governing organization loses coherence -> former authority is constrained -> subsequent processing reorganizes.*

The framework therefore predicts that learning and insight need not produce identical biological trajectories even when both culminate in the same verbal proposition or correct behavioural response. One person may learn that the apparent division in an illusion is produced by a concealed mechanism; another may directly observe that mechanism and become unable to interpret the performance as a literal bodily division. Both may answer a factual question correctly and possess the same verbal description. The difference should emerge when the former organization is reactivated.

The learned explanation may coexist with a still-viable prior interpretation, producing competition, uncertainty, or the need for correction. By contrast, where direct perception has rendered the former organization nonviable, the sensory appearance may remain compelling while its previous literal authority does not. The relevant empirical distinction is therefore not whether the stimulus still looks familiar, but whether the old organization can again govern interpretation, recruit doubt, or require repeated corrective control. [101, 204]

15.17.2 Recurrence of the former interpretation

Recurrence provides one of the clearest tests. After ordinary knowledge acquisition, the former interpretation may return when attention is limited, the stimulus is ambiguous, the organism is fatigued, the original context is restored, time has passed, or the corrective information is no longer actively maintained. The newly acquired knowledge may then need to be retrieved and applied. [22, 57, 68, 96, 97, 101, 149, 204]

> *The learning trajectory may be represented as:*
> *old interpretation activates -> contradictory knowledge is recalled -> conflict or correction occurs -> revised response is produced.*
> *In this sequence, the former organization remains viable enough to arise as a governing interpretation and must be opposed by additional content. Following recursive reorganization, the prediction is different:*
> *old representation may activate -> the incompatible relation remains operative -> the former interpretation fails to regain literal authority -> little or no corrective effort is required.*

A representation can therefore recur without recovering authority. An individual may report that an illusion still appears compelling for an instant, yet this perceptual appearance does not establish that the prior literal interpretation has returned. The relevant questions are whether the individual again believes the appearance, whether uncertainty or extended explanation is recruited, whether corrective reasoning becomes necessary, and whether the old interpretation regains authority under stress or reduced attention. The prediction is not the elimination of residual content; it is the loss of that content's former governing capacity.

15.17.3 Longitudinal stability

Knowledge acquisition and insight should also differ in longitudinal stability. Newly acquired information can weaken without rehearsal, become less accessible under altered conditions, or compete with stronger prior associations. Performance may decline when contextual support is removed. Where a governing organization has become nonviable, its loss of authority should be relatively more stable than a recently learned corrective proposition. [94, 96, 101, 203]

Empirical comparison should therefore extend beyond immediate post-event testing. Assessment across minutes, hours, days, weeks, and longer intervals where feasible should examine whether the previous organization regains authority, whether rehearsal of the new explanation is required, whether the old interpretation returns when the original context is restored, and whether cognitive load or stress reinstates the former relation. [22, 68, 96, 97, 101, 149, 205]

A durable insight should not depend upon continuously remembering a conclusion. The relation that rendered the old organization nonviable should remain expressed in the way subsequent events are organized. This does not imply perfect invariance. Biological systems are context-sensitive, and a limited perception may produce domain-specific reorganization. The prediction concerns the relative stability of a genuinely constrained organization compared with content maintained through ordinary learning.

15.17.4 Transition probabilities

The proposed distinction should be visible in transition probabilities within the recursive system. Before reorganization, a stimulus may reliably evoke an established interpretation, organism-relative evaluation, and expected response. After knowledge acquisition, the former interpretation may still arise and be followed by retrieval of corrective knowledge, comparison, conflict, and eventual revision. After insight, the old representation may activate briefly, but the incompatibility is already embodied and the prior trajectory fails to become governing.

> *The three trajectories can be summarized as:*
> *Prior organization: stimulus -> old interpretation -> organism-relative evaluation -> established response.*
> *Learning: stimulus -> old interpretation -> corrective knowledge retrieved -> comparison or conflict -> revised response.*
> *Insight: stimulus -> old representation may activate -> governing incompatibility remains operative -> old trajectory fails -> alternative organization or direct registration governs.*

The important variable is whether the old organization remains a probable intermediate governing state. Learning may add a corrective branch while leaving the original trajectory available. Insight should reduce the probability of entering that trajectory or sharply shorten its duration. Transition measures may therefore be more informative than final accuracy alone. Participants may arrive at the same answer while differing in latency, conflict, recurrence, effort, error rate, autonomic amplification, and probability of reverting to the former interpretation.

15.17.5 Distributed coordination rather than isolated encoding

If insight changes a governing organization rather than adding isolated content, the associated biological change may involve altered coordination among distributed systems rather than only local encoding of a new fact. Knowledge acquisition may strengthen representations of the new information, its context, semantic relations, and associated actions. Recursive reorganization may additionally alter how the formerly governing representation interacts with salience, memory retrieval, prediction, autobiographical indexing, conflict monitoring, affective response, and action selection. [14, 21, 35, 69, 119]

The framework does not predict one universal connectivity pattern. Different targets, organisms, and contexts may recruit different systems. The stronger prediction is relational: when the prior organization is reactivated, the systems that formerly reinstated, amplified, and applied it should exhibit altered coordination. Candidate consequences include weaker coupling between the old representation and autobiographical continuation, reduced recruitment of corrective conflict, altered coordination between salience and memory, shorter recurrent activation, and faster transition into an alternative or directly registered organization.

These are candidate consequences rather than established biomarkers. A connectivity difference alone would not establish recursive reorganization. It would need to converge with behavioural stability, loss of former authority, preserved practical cognition, reduced recurrence, and the temporal pattern of reactivation and termination.

15.17.6 Memory reconsolidation and functional meaning

The distinction may also be examined through the functional status of memory when the former organization is reactivated. Ordinary learning may create an additional memory while leaving the prior interpretation intact. The organism later retrieves both the old organization and the corrective information and resolves their competition. Insight may produce a different relation: the prior memory remains accessible, but its meaning and governing status are altered. [94, 96, 101, 114]

The earlier interpretation may be remembered as what was once believed, how the illusion appeared, or how a former organization operated. It is no longer retrieved as a presently viable account. The proposal therefore concerns reorganization of the functional meaning of retained content rather than simple deletion. The memory may persist while its affective force, expectancy, behavioural control, conflict recruitment, and capacity to initiate associated recursive trajectories are reduced. [96, 101, 114]

The relevant empirical question is not merely whether the memory can still be recalled. It is what that memory continues to organize when it returns. Retention of content combined with failure to reinstate the former interpretation would support the distinction between memory persistence and loss of governing authority.

15.17.7 Context-dependent reactivation

Context provides a critical test because learned corrections often remain tied to the conditions under which they were acquired. The old organization may return when the original relationship or environment is restored, a strong emotional cue appears, stress

increases, or corrective information becomes less accessible. Insight should show greater resistance to contextual renewal where the relevant organization has been extensively constrained. [22, 57, 101, 204]

This prediction must be qualified by scope. A person may reorganize one expression of fear while a related but distinct fear organization remains viable. A change observed in one relationship may not generalize to another if the second recruits a different configuration of memory, role, injury, expectation, and defence. Context-dependent recurrence may therefore indicate limited scope, incomplete perception, continued operation of a related organization, or primarily learned correction rather than insight.

Useful empirical designs should compare the original context, a novel context instantiating the same underlying relation, a context with similar surface content but a different governing organization, and a stress condition likely to recruit the former pattern. Broad recursive reorganization should generalize across contexts that share the same structural relation even when their superficial content differs. Content-specific learning may remain more closely tied to the trained stimulus or explanation. [22, 57, 101, 204, 205]

15.17.8 Effort and corrective control

A further predicted difference concerns effort. Where the old organization remains viable, an individual may need to remember the new rule, monitor for the old response, oppose it, reinterpret the event, or deliberately apply corrective knowledge. The new information governs through active control. Where insight has rendered the prior organization nonviable, the alternative should not require continuous effort to defeat the old interpretation. [68, 116, 149, 202]

> *The contrast is:*
> *Learning with a competing organization: old response arises -> conflict is detected -> corrective knowledge is applied -> effortful revision occurs.*
> *Insight: old representation may arise -> former organization lacks governing viability -> no extended conflict or correction is required.*

Effort is not predicted to disappear from all subsequent behaviour. A practical task may remain difficult and may require concentration, memory, or deliberate action. The relevant variable is the effort needed to prevent the former interpretation from regaining authority. Persistent monitoring and corrective maintenance would suggest that the old organization remains viable and is being controlled rather than constrained through insight. [68, 149, 203]

15.17.9 Behavioural and biological trajectories

Knowledge acquisition and insight should therefore be compared as trajectories rather than as isolated endpoints. A learning trajectory may involve encoding of new information, improved explicit accuracy, continuing competition from the former organization, context-dependent recurrence, corrective effort, and gradual strengthening through rehearsal. A candidate insight trajectory may involve direct perception of an incompatible relation, rapid or progressively consolidated loss of the former organization's authority, retention of representational content, reduced recurrence as a governing interpretation, altered transition probabilities, less corrective conflict, and relative stability without continuous rehearsal. [94, 96, 101, 203]

The biological implementation may vary. The framework does not require every insight to occur instantaneously or through a single neural event. A gradual investigation may culminate in reorganization, while a sudden and striking event may merely add memorable information. The decisive criterion is not subjective suddenness but what subsequently happens to the former governing organization.

15.17.10 Empirical support and falsification

The proposed distinction would be supported if candidate insight, relative to ordinary knowledge acquisition, showed greater longitudinal stability, less restoration of the old interpretation under context change, reduced need for deliberate correction, lower probability of entering the prior recursive trajectory, preserved access to old content as memory, and altered biological coordination when the former organization is reactivated.

The distinction would be weakened if knowledge acquisition and claimed insight consistently produced indistinguishable patterns of recurrence, stability, effort, context dependence, transition probability, and biological response. It would also be weakened if an organization described as nonviable repeatedly regained its former unquestioned authority under the same conditions.

The framework does not require every event ordinarily labelled “insight” to satisfy these predictions. Common usage applies the term broadly to discovery, realization, learning, and improved performance. The empirical task is narrower: to determine whether the specific form of recursive reorganization proposed here can be distinguished from acquisition of corrective content. Its scientific value depends upon whether the loss of governing authority can be operationalized and identified through convergent behavioural, biological, temporal, and context-sensitive evidence.

15.18 Conceptual Knowledge Versus Direct Perception

The distinction between conceptual knowledge and direct perception becomes especially important when the target is the self-generating movement. A person may sincerely and accurately accept that the self is constructed, virtual, emergent, narratively sustained, or dependent upon memory and biological processing. Such acceptance does not establish that the organization of the self as an independent thinker, observer, evaluator, controller, owner, or sufferer has lost governing authority.

The proposition that the self is constructed can itself be incorporated into the recursive audit as knowledge possessed by an apparent knower. The content describes the architecture while the organization described may remain intact. [5–7, 69, 195]

Direct perception is proposed to produce a different consequence. What is perceived is not merely the truth of a sentence but the present causal operation through which thought, functioning through psychological time, generates the apparent centre and subsequently attributes cognition and experience to it. If that relation is directly perceived and the prior causal interpretation becomes nonviable, the virtual reference point should no longer recover the same unquestioned authority within the domains in which the organization has been constrained.

The empirical contrast is therefore not between an uninformed participant and an informed participant. It is between conceptual acceptance of the architecture and loss of governing authority of the organization the architecture describes. These conditions may produce similar language while differing substantially in cognitive recruitment, behavioural response, autonomic recovery, metabolic duration, contextual stability, and the multidimensional Friction Signature.

15.18.1 Matched Verbal Knowledge

A useful comparison should match participants as closely as possible on explicit conceptual knowledge. Both groups might accurately explain that memory contributes to self-continuity, language stabilizes self-reference, narrator-mediated attribution occurs downstream of primary processing, cognition can precede explicit self-representation, and practical choice does not require an independently existing psychological agent. If one group possesses conceptual understanding while another has undergone the proposed reorganization, their verbal explanations may overlap substantially. [5–7, 69, 195–199]

The predicted difference should emerge when the self-generating organization is recruited rather than when the theory is merely described. Verbal sophistication can conceal structural continuity. A participant may provide an elaborate account of constructed selfhood while becoming strongly defensive when intelligence is questioned, work is criticized, status is threatened, social identity is challenged, an injury is recalled, or a desired future identity is frustrated. The conceptual account may be accurate while the virtual reference point continues to govern the response. [11–13, 21, 56, 57, 69, 119]

Explicit agreement with the framework should therefore correlate imperfectly with loss of self-referential authority. Report remains informative, but doctrinal accuracy cannot serve as the defining criterion of direct reorganization.

15.18.2 Self-Referential Recursion

Conceptual acceptance should not necessarily produce the same alteration in self-referential recursion as direct perception of the generating relation. Relevant continuation may include autobiographical interpretation, imagined evaluation by others, defence of identity, comparison with an ideal self, rehearsal of psychological injury, future projection of personal completion, and repeated attribution of cognitive events to an independent owner. Conceptual knowledge may modify the language applied to these processes without materially changing their recruitment. [12, 13, 21, 69, 119]

A participant may recognize a reaction as an expression of constructed selfhood while the reaction continues to recruit memory, defence, comparison, autonomic activation, and prolonged psychological time. The theory then becomes another layer of commentary upon the same trajectory. Where the relevant organization has been extensively constrained, a residual self-referential representation may still arise, but it should be less capable of recruiting autobiographical continuation, defensive narration, ownership, future becoming, comparison, or prolonged evaluator-evaluated conflict. [11–13, 21, 114, 119]

The two trajectories can be stated schematically:

> Conceptual knowledge: self-relevant event -> self-reference activates -> theory of construction is recalled -> reaction and knowledge compete -> monitoring and narration continue.

> Direct perception: self-relevant event -> residual self-reference may arise -> independent authority is absent -> little or no recursive gain occurs -> practical response or termination follows.

The prediction concerns recursive gain rather than permanent elimination of every self-referential representation. Less corrective effort should be required where the former organization has lost viability than where it remains active and is opposed by another belief.

15.18.3 Stability Across Contexts and Scope

Conceptual knowledge may remain strongly context-dependent. A person may understand the architecture during quiet reflection, discussion, or structured practice while the former organization returns under criticism, status threat, relational conflict, fatigue, fear, loss, social comparison, or uncertainty. The explanation remains available but does not govern the organism strongly enough to prevent renewed self-organization. [11, 15, 22, 57, 101, 204, 205]

A genuine reorganization should show greater stability across contexts that recruit the same underlying relation. This prediction must remain indexed to scope. Direct perception through one fear organization does not entail that social ambition, attachment, intellectual authority, or another conditioned configuration has also been constrained. The empirical claim must therefore specify the organization and domains in which loss of authority is proposed.

Where scope is extensive, superficially different events should show convergent reduction in the common recursive trajectory:

> event -> meaning attributed to the virtual self -> identity defended or condemned -> future becoming recruited -> psychological conflict prolonged.

Conceptual understanding may perform well only while the theory is consciously accessible. Direct reorganization should instead be expressed in spontaneous response even when no explanatory proposition is being rehearsed.

15.18.4 Psychological Suffering: Primary Response and Recursive Elaboration

The framework predicts that conceptual acceptance alone will not necessarily attenuate psychological suffering to the same degree as direct perception of the self-generating division. A person may know that observer and observed, or evaluator and evaluated, belong to one conditioned movement while fear still generates a controller attempting to suppress fear, shame still generates an internal judge, injury remains repeatedly appropriated, and desire projects a future self whose attainment promises completion. The propositions are known while the generating organization remains active.

Where the relevant division has been constrained, a primary event should be less likely to become prolonged recursive conflict. The comparison is between:

Primary trajectory:

condition or event

-> organism-relative significance is registered

-> an appropriate biological, affective, or practical response occurs

-> the response terminates when the present requirement ends.

Recursive trajectory — initial generation of psychological conflict:

condition, event, memory, or projection

-> the organism encounters the condition through accumulated biological and psychological history stored as memory

-> conditioned evaluation assigns the condition positive, negative, threatening, desirable, incomplete, insulting, unjust, or otherwise significant value

-> that evaluation recruits or modifies a biological state transition and its organism-relative inside view as subjective feeling

-> cognitive thought represents the condition, its assigned significance, the subjective feeling, or the relation among them

-> the experience is indexed to the historically maintained apparent “me” and represented as something happening to “me”

-> division arises between the apparent “me” and the condition, feeling, or problem it is represented as facing.

Recursive trajectory — maintenance of psychological conflict:

the apparent evaluator, operating as thought, attempts to alter, escape, defend, justify, secure, improve, or transform the apparent “me”

-> thought generates another representation, such as an explanation, memory, imagined response, feared outcome, desired future, condemnation, comparison, or proposed solution

-> that representation functions as a new present internal stimulus even though the represented event may be absent, past, future, or imagined

-> the internal stimulus may recruit or modify a further biological state transition and subjective feeling

-> the altered state, feeling, and representational content become fresh present conditions for conditioned evaluation

-> the new condition is again interpreted in relation to the apparent “me”

-> further thought is recruited to evaluate, control, resist, defend, resolve, or escape the renewed condition

-> the evaluator, the evaluated problem, and the proposed solution are regenerated within the same movement

-> division and psychological conflict continue without requiring another external event.

This prediction does not imply elimination of pain, grief, sadness, biological fear, or traumatic activation. The expected attenuation concerns suffering sustained through the false authority of the owner, evaluator, controller, and psychological sufferer. A candidate direct-perception group may still show immediate startle, sadness, pain, or appropriate concern. The relevant differences should appear in duration, reactivation, autobiographical ownership, self-defensive elaboration, and recovery. [23, 27, 28, 205, 206]

15.18.5 Autonomic Trajectory

If self-referential recursion repeatedly recruits threat appraisal, defence, anticipation, and allostatic regulation, conceptual knowledge and direct perception should not necessarily produce the same autonomic trajectory. A conceptually informed participant may report that criticism threatens only a constructed identity while still showing sustained sympathetic recruitment, altered heart-rate variability, respiratory change, muscular tension, skin conductance, or delayed recovery. These are candidate measures rather than a required universal profile. [11–13, 21, 120]

Immediate organismic activation may remain appropriate in both conditions. The selective prediction concerns sustained amplification:

Conceptual knowledge: self-relevant stimulus -> immediate autonomic response -> recursive self-interpretation -> continued cognitive recruitment -> sustained or reactivated autonomic load.

> Direct perception: self-relevant stimulus -> immediate organismic response may occur -> independent self-ownership is not extensively recruited -> recursive amplification is reduced -> recovery occurs more rapidly.

Peak response alone would be insufficient. More informative measures include duration, area under the response trajectory, reactivation following memory prompts, recovery time, and coupling between cognitive continuation and autonomic state. A lower peak with unchanged duration would not be equivalent to rapid termination of a recursive trajectory. [12, 13, 120]

15.18.6 Metabolic and Network Consequences

Sustained recursive cognition carries biological cost. Memory retrieval, prediction, autobiographical elaboration, conflict monitoring, autonomic coordination, and repeated network recruitment require energy. The framework therefore predicts that direct constraint of a self-referential organization may produce a different metabolic trajectory from conceptual acceptance of the same proposition. [16, 33–35, 42, 119]

Conceptual knowledge may add cognition to cognition: a self-referential response is followed by theoretical monitoring and evaluation of whether the theory is being applied correctly. This may reduce some conflict while preserving or adding recursive overhead. Direct perception should reduce the need for continuing correction where the former organization has lost viability.

The prediction is selective rather than global. Perception, learning, skilled action, and difficult practical thought can require substantial metabolic recruitment. The expected difference is reduced duration and recurrence of metabolic demand that previously extended beyond the actual requirement through self-monitoring, defence, autobiographical continuation, or projected resolution.

Candidate measures may include regional glucose utilization, oxygen consumption, cerebral blood flow, duration of network-specific activation, sustained cortical activity, and organism-level metabolic consequences associated with prolonged autonomic load. Comparisons should match the initiating condition, sensory input, task demand, and practical response requirement. The proposed difference lies in the additional recursive trajectory: preserved task-relevant activity together with reduced extension after the actual demand has ended. No single local or network measure would establish direct perception by itself. [16, 33–35, 42, 118–121]

15.18.7 The Multidimensional Friction Signature

The Friction Signature provides the broadest predicted contrast because it is not a single biomarker. It refers to a convergent organism-level trajectory associated with sustained recursive recruitment and restoration of nonequilibrium organization. Candidate dimensions include local heat production, glucose metabolism, oxygen consumption, network activity and coordination, autonomic activation, allostatic load, and total metabolic or entropy-producing cost. [12, 13, 16, 33–35, 42, 44, 118–121]

Conceptual knowledge may alter one component without reorganizing the entire trajectory. Verbal report may change while autonomic amplification persists; subjective distress may decline while recurrent thought continues; behaviour may be controlled while metabolic duration remains elevated; or concentration may suppress outward expression while internal conflict remains active. Direct perception of the governing organization should produce a more coherent alteration across the dimensions coupled to the constrained process.

The prediction is not that every measure must decrease simultaneously or by the same amount. It is that the sustained self-amplifying trajectory should fail to develop fully or should terminate more rapidly:

> Conceptual knowledge: trigger -> self-referential organization activates -> conceptual interpretation is added -> recursive continuation may persist -> Friction Signature remains prolonged or internally conflicted.

> Direct perception: trigger -> residual activation may occur -> former self-organization fails to regain authority -> recursive amplification is absent or sharply reduced -> Friction Signature is attenuated or terminates rapidly.

This distinction requires longitudinal and cross-context testing. One calm laboratory session cannot establish durable reorganization.

15.18.8 Operationalization and Comparison Design

Direct perception cannot be operationalized solely by asking whether a participant has experienced it. Self-report is indispensable for identifying phenomenological claims, but it is vulnerable to conceptual imitation, demand characteristics, social expectation, retrospective reconstruction, spiritual or intellectual identity, and misunderstanding of the proposed distinction. A person may sincerely believe that the generating movement has been perceived while the organization remains active; another may undergo substantial reorganization without using the framework's terminology.

A stronger operational approach would require convergence among phenomenological report, behaviour across relevant contexts, recurrence of the former organization, effort required for regulation, duration and branching of cognitive chains, autonomic trajectory, metabolic or network measures, and longitudinal stability. The target and scope must be specified in advance. A claim concerning one fear organization should not be tested as though it entailed absence of self-referential recursion in every domain.

A provisional comparison could include an uninformed control condition, a conceptual-education condition, and a candidate direct-reorganization condition. All groups would encounter comparable self-relevant challenges. The conceptual group would

demonstrate accurate understanding of the architecture. The candidate reorganization group would be classified provisionally through detailed phenomenological report together with convergent evidence that the specified organization has lost authority.

Measurements could examine the initial organismic response, self-referential interpretation, number and duration of subsequent thoughts, autobiographical elaboration, behavioural defence, autonomic activation, metabolic or network duration, recovery time, and recurrence under later context changes. The expected distinction is probabilistic rather than absolute. Individual history, biological state, scope of reorganization, and experimental context will produce variation.

15.18.9 Alternative Explanations

Any apparent reduction in self-referential recursion must be distinguished from suppression, avoidance, emotional numbing, dissociation, sedation, fatigue, social desirability, learned performance, and temporary concentration. Suppression may reduce outward report while increasing monitoring and conflict. Avoidance may prevent recruitment of the relevant trigger. Dissociation may alter ownership through impaired integration rather than perception of the virtual reference point. Sedation may reduce cognition globally. Social desirability and learned performance may change the answer without changing the organization. [38–40, 46, 47, 68, 73–75, 116, 149, 202]

The proposed direct-reorganization pattern instead requires preserved phenomenology, practical cognition, appropriate response to actual conditions, reduced unnecessary recursion, rapid termination of residual activation, and stability without continuous effort. These features must converge; none is sufficient alone.

15.18.10 Falsification Conditions

The distinction between conceptual knowledge and direct perception would be weakened if conceptually informed participants consistently exhibited the same durable changes as candidate direct-reorganization participants across self-referential recursion, contextual stability, psychological suffering, autonomic trajectory, metabolic duration, and the Friction Signature. It would also be weakened if claimed direct perception altered only language or belief while the former organization returned unchanged, defensive and autobiographical trajectories persisted, continuous effort remained necessary, and biological amplification showed no selective attenuation.

Conversely, the distinction would receive support if accurate conceptual knowledge could be separated from a more durable pattern characterized by loss of the former organization's authority, reduced recursive gain, less autobiographical continuation, more rapid autonomic recovery, reduced metabolic extension beyond actual demand, preserved practical cognition, and stability across the conditions in which the previous organization had operated.

The central prediction is therefore that a person may understand that the self is constructed while continuing to organize experience around an apparent independent knower, owner, evaluator, controller, and sufferer. Where the self-generating movement has been directly perceived and extensively constrained, the same verbal knowledge should be accompanied by a broader loss of self-referential authority expressed across cognition, behaviour, autonomic regulation, metabolic trajectory, and the multidimensional Friction Signature.

Conceptual knowledge changes what the organism can say about the structure. Direct perception changes whether the structure remains capable of governing.

15.19.0 Domain-Specific Psychological Friction Signatures

The framework predicts that psychological reorganization will often be domain-specific rather than globally uniform. A recursive organization may lose authority in relation to one fear, relationship, identity, or anticipated outcome while other conditioned organizations remain capable of generating psychological conflict. Empirical claims must therefore be indexed to the target and scope of the organization proposed to have been constrained.

The central domain-specific prediction is that, where the recursive organization sustaining anxiety in a specified domain has been extensively constrained, the corresponding anxiety trajectory and multidimensional Friction Signature should fail to develop fully or should be drastically attenuated when that domain is recruited again. This claim does not require the disappearance of every initial response. A familiar cue may still activate retained memory, a brief thought, bodily sensation, orienting response, autonomic adjustment, or previously learned expectation. Historically conditioned biological pathways may remain available after the organization they formerly supported has lost governing authority. The predicted change concerns what those activations are capable of recruiting next.

15.19.1 Trajectory rather than isolated response

Before reorganization, a domain-relevant cue may activate a conditioned memory or prediction, acquire significance in relation to the virtual reference point, and be projected through psychological time. Autobiographical confirmation, defensive or controlling thought, autonomic recruitment, and additional threat-related cognition may then amplify one another. The initiating event becomes the source of an extended trajectory in which each cognitive product renews organism-relative threat and supplies conditions for further recruitment. [11–13, 21, 56, 57, 114, 119, 120]

The contrast can be represented schematically:

Before extensive constraint: domain-relevant cue -> conditioned memory or prediction -> significance for the virtual self -> threat projection and autobiographical confirmation -> defensive cognition -> autonomic and metabolic amplification -> further threat-related thought -> sustained anxiety trajectory.

After extensive constraint: domain-relevant cue -> residual memory, thought, or bodily activation may occur -> no unresolved present danger is registered -> little or no recursive gain -> autobiographical and anticipatory elaboration fail to develop -> activation terminates rapidly.

The corresponding Friction Signature is not a single measure. In the unconstrained condition it may involve sustained recursive cognition, altered respiration, muscular tension, changes in heart-rate variability, continued threat and salience recruitment, increased metabolic demand, prolonged network engagement, and delayed return toward the organism's prior regulatory condition. Where the generating organization has lost authority, one or more early components may still appear, but the coordinated self-amplifying trajectory should be less probable, shorter, and less capable of reactivation. [12, 13, 16, 21, 33–35, 42, 56, 57, 118–121]

The relevant empirical question is therefore not merely whether any response is detected. It is whether residual activation recruits the organization that formerly prolonged anxiety through ownership, autobiographical elaboration, catastrophic projection, control, and psychological time. A conditioned thought such as “What if that happens again?” may arise, and a bodily response may briefly occur, without recovering the former capacity to sustain the trajectory.

15.19.2 Defining drastic attenuation

The phrase “drastically attenuated” must refer to the complete trajectory rather than to a single peak measurement. A reduced peak physiological response would not establish reorganization if repeated cognitive reactivation sustained the response over time. Conversely, the initial magnitude might remain similar while the trajectory terminated much more rapidly. The framework therefore predicts changes in temporal organization rather than a necessary uniform decrease at every point. [11–13, 21, 120]

A complete characterization should include response magnitude, duration, recurrence, recursive persistence, autonomic amplification, metabolic burden, context- or memory-dependent reactivation, and recovery time. Magnitude concerns intensity at a given moment. Duration concerns how long activation persists. Recurrence concerns whether it returns after apparent termination. Recursive persistence concerns whether one thought, memory, or prediction recruits another. Autonomic amplification concerns the extent to which continued cognition prolongs organism-level physiological response. Metabolic burden concerns the energy-dependent recruitment required to sustain that trajectory. Recovery time concerns how rapidly the organism returns toward its prior regulatory organization after the initiating condition has ended. [11–13, 16, 21, 120]

A drastically attenuated trajectory might therefore include a moderate but brief initial response, little autobiographical elaboration, minimal future projection, rapid autonomic recovery, low probability of renewed activation, and no extended chain of anxiety-related cognition. The initial response has not necessarily disappeared; its recursive continuation has been sharply reduced.

This distinction is particularly important in anxiety research because an exclusive focus on peak response could conceal the proposed transformation. The strongest comparison would examine the entire time course: baseline, initial cue registration, the interval in which recursive elaboration would ordinarily develop, the period after cue removal, and later opportunities for spontaneous or prompted reactivation. Relevant questions include whether the cue becomes organized as a threat to “me,” recruits related autobiographical memories, generates repeated future scenarios, remains coupled to autonomic activation, and requires deliberate effort to terminate. [11–13, 21, 56, 57, 120]

15.19.3 Reorganization versus learned regulation

Domain-specific reorganization must be distinguished from successful regulation. A participant may reduce anxiety by reappraising a cue, repeating reassurance, redirecting attention, controlling respiration, suppressing thought, or avoiding the relevant context. These strategies may be useful, but they do not by themselves establish that the anxiety-generating organization has lost authority. [68, 116, 149, 202]

The difference can be expressed as follows:

Learned regulation: anxiety organization activates -> participant detects the response -> a learned cognitive or physiological strategy is retrieved -> competing control is imposed -> response gradually decreases.

Extensive constraint: conditioned activation may occur -> the former organization fails to acquire recursive gain -> no prolonged intervention is required -> response terminates naturally.

The distinction concerns whether the trajectory must be actively managed or whether it fails to develop. Continuous dependence upon suppression, reassurance, distraction, concentration, environmental control, or avoidance would indicate that the old organization remains viable even if overt anxiety is reduced. This qualification does not exclude practical action. Where the cue corresponds to actual danger, cognition and protective behaviour should be recruited. The prediction applies where the former trajectory was sustained primarily through recursive projection, ownership, and self-defensive continuation after no present danger remained unresolved. [68, 116, 149, 202]

15.19.4 Domain specificity and scope

A reduction in one anxiety organization should not be generalized automatically to the organism as a whole. An individual may undergo extensive reorganization concerning public speaking, health anxiety, fear of rejection, financial insecurity, one traumatic reminder, or one particular relationship while continuing to exhibit anxiety elsewhere, shame, comparison, status protection, defensiveness, ownership, or relational conflict. Such outcomes are compatible with domain-specific reorganization. They establish limited scope rather than falsity of the proposed mechanism. [56, 57, 101, 204, 205]

This qualification prevents two opposite errors. One would be to infer global transformation from a single domain-specific change. The other would be to dismiss a genuine reorganization because unrelated conditioning remains active. The target, recruiting context, and predicted consequence must correspond. The claim should be stated narrowly: where the recursive organization generating anxiety in a specified domain has been extensively constrained, the sustained trajectory associated with that organization should fail to arise or should be drastically attenuated.

15.19.5 Partial reorganization within a domain

Reorganization may also be partial within one domain. A person may recognize that one feared outcome is improbable while retaining psychological ownership of the possible consequence, the demand for certainty, the observer-observed division, or the broader organization of self-security. Anxiety may then weaken around one representation while shifting to another uncertainty. This would indicate altered content or partial constraint rather than extensive reorganization of the generating structure.

The pattern may take the following form:

> *specific feared outcome loses credibility -> underlying demand for certainty remains -> another possible threat acquires relevance -> anxiety shifts rather than terminates.*

More extensive domain-specific reorganization would require perception of the wider causal movement: memory reconstructs the feared event; projection extends it into the future; ownership organizes the outcome as happening to an apparent psychological centre; control attempts to produce certainty; resistance amplifies the response; and automatic recursive relevance allows one threat representation to generate another. Where this wider movement has lost authority, anxiety should not simply migrate to a new representation within the same domain.

Empirical analysis should therefore distinguish symptom substitution, temporary reduction, learned coping, avoidance, partial reorganization, and extensive constraint of the domain-specific organization. These conditions may all reduce reported anxiety while producing different recurrence, effort, autonomic, metabolic, and contextual trajectories. [68, 101, 116, 149, 202, 204, 205]

15.19.6 Multidimensional convergence

The predicted Friction Signature should be evaluated through convergence rather than any single marker. Candidate dimensions include subjective report, thought frequency, cognitive-chain duration, autobiographical recruitment, behavioural avoidance, sympathetic-parasympathetic balance, heart-rate variability, skin conductance, respiratory pattern, muscular tension, cerebral blood flow, glucose and oxygen utilization, network coordination, and total duration of organism-level activation. These variables are proposed measurement domains, not established markers uniquely diagnostic of insight. [12, 13, 16, 33–35, 42, 44, 118–121]

Extensive constraint should alter the organization of this convergence. A residual cue may still produce early activation in one or more dimensions. The more distinctive prediction is reduced transition into autobiographical and anticipatory cognition, weaker coupling between continued thought and physiological amplification, shorter metabolic recruitment, more rapid autonomic recovery, and lower probability of later spontaneous reactivation. Early conditioned response may remain while downstream recursive amplification is sharply reduced.

This temporal separation may help distinguish primary biological response from psychological continuation. The expected change is not necessarily uniform reduction across every measure, because early components may reflect retained learning or immediate organismic registration. The critical prediction is that the complete coordinated trajectory terminates substantially earlier and becomes less capable of restarting itself.

15.19.7 Comparison conditions

A useful empirical design would compare the same domain-specific trigger across ordinary anxiety, conceptual understanding of the mechanism, learned regulation or coping, temporary attentional suppression, partial reorganization, and candidate extensive reorganization. Initiating cues, practical demands, and sensory conditions should be held as constant as possible. Measurements should capture initial registration, onset and peak of autonomic response, number and duration of subsequent anxiety-related thoughts, autobiographical elaboration, future projection, behaviour, metabolic duration, recovery time, and delayed reactivation. [11–13, 16, 21, 56, 57, 68, 116, 118–121, 149, 202]

The expected patterns are probabilistic. Ordinary anxiety should be more likely to show extensive recursive amplification and a prolonged Friction Signature. Conceptual understanding may add accurate commentary or deliberate correction while leaving much of the trajectory intact. Learned regulation should reduce the response through effortful strategy. Temporary attentional suppression should reduce cognition while attention is maintained, with return of the former organization after release. Partial reorganization should reduce selected components while leaving others capable of sustaining anxiety. Candidate extensive reorganization should permit residual conditioned activation but show little recursive gain, rapid termination, and failure of the former sustained Friction Signature to develop.

15.19.8 Falsification and central prediction

The domain-specific prediction would be weakened if a supposedly constrained anxiety organization repeatedly reproduced its prior thought-chain length, autobiographical continuation, future projection, autonomic amplification, metabolic duration, recurrence, and recovery time under the same recruiting conditions. It would also be weakened if the reduction depended continuously upon suppression, avoidance, reassurance, environmental control, concentration, or deliberate application of a learned strategy. Such findings would be more consistent with successful regulation than with loss of governing authority.

The prediction would receive support if residual thoughts or bodily responses occasionally occurred but remained brief; the former autobiographical and anticipatory trajectory failed to develop; autonomic and metabolic amplification were sharply shortened; recovery occurred rapidly; the change persisted across relevant contexts without continuous effort; and practical response to actual danger remained intact.

The central claim can therefore be stated precisely: where the recursive organization generating anxiety in a particular domain has been extensively constrained, retained biological pathways may still produce residual conditioned activation, but that activation should receive little recursive amplification, terminate rapidly, and fail to generate the former sustained psychological and organism-level Friction Signature. The predicted transformation concerns the trajectory as a whole, not merely a smaller feeling. It is a reduced capacity of the old organization to initiate, sustain, reactivate, and biologically amplify anxiety through psychological time.

15.20.0 Preserved L1 and Practical Cognition

Any reduction in unnecessary recursive cognition must be distinguished from generalized loss of brain function. Sedation, fatigue, anesthesia, neurological impairment, reduced arousal, cognitive decline, dissociation, and pharmacological suppression can all reduce spontaneous thought while also diminishing perception, memory, responsiveness, integration, or task performance. The present framework predicts a different organization. Insight into the self-generating movement and the conditioned continuity of cognition should reduce unnecessary recursive occupation while preserving primary phenomenology, sensory registration, memory, language, planning, problem-solving, learned skill, task performance, and organismic response to actual danger. [38–40, 46, 47, 73–75, 96–99]

The relevant empirical contrast is therefore selective reorganization rather than global quieting. Thought should remain biologically available wherever an actual practical, organismic, or environmental requirement recruits it. What should diminish is cognition whose continuation is generated primarily by its own internally produced content after no unresolved requirement remains.

15.20.1 Preserved L1 phenomenology

L1 primary organism-relative phenomenology should remain. The inside view does not depend upon continuous narrator-mediated cognition or upon the virtual reference point being treated as an independent owner. Sensory and organism-relative integration precede the downstream attribution of experience to a psychological subject. Where unnecessary thought is absent, the organism should remain capable of registering light, sound, movement, bodily sensation, pain, affective tone, spatial relation, and changing environmental conditions. [30, 38–40, 136, 137, 191–194]

The absence of psychological time should therefore not be interpreted as absence of consciousness. The predicted pattern is preserved present phenomenology together with reduced narrator-mediated reconstruction, ownership, comparison, and projection. A participant may report fewer thoughts while remaining fully responsive to present events. This differs from global suppression, in which reduced cognition is accompanied by diminished awareness, impaired responsiveness, reduced integration, or loss of reportable experience. [30, 38–40, 137, 191–194]

The contrast can be stated compactly:

> *Selective reorganization: unnecessary recursive cognition decreases -> L1 phenomenology and practical responsiveness remain.*
> *Global suppression: large-scale cognitive and integrative capacity decreases -> phenomenology, responsiveness, access, or task performance may also diminish.*

15.20.2 Sensory registration and organismic salience

Sensory registration should remain capable of detecting relevant change. The organism should orient toward a sudden sound, detect movement, discriminate visual or auditory stimuli, register bodily discomfort, recognize familiar persons and objects, and respond to changing environmental conditions. Choiceless awareness does not imply sensory indifference, passivity, or inability to prioritize relevant information. Organism-relative salience remains necessary, and actual danger should continue to recruit attention and action. [23, 27, 28, 56, 136]

The predicted change concerns what follows after an event has been registered and resolved. A loud noise may produce startle and orientation; once its source is identified as harmless, the response can terminate. The primary sensory and biological response remains, but it need not become a self-referential sequence concerning why the organism reacted, what the reaction means about the self, or whether the event will recur. Early registration is preserved while unnecessary recursive extension is reduced.

15.20.3 Preserved memory and language

Memory should remain available for practical and autobiographical use. The organism should recognize familiar information, recall instructions and commitments, retrieve learned knowledge, use prior experience to guide action, and describe relevant personal history. The proposed reorganization does not erase accumulated knowledge. It changes whether memory is compulsively recruited to sustain psychological ownership, defence, comparison, injury, or projected completion. [5–7, 9, 10, 96, 97]

> *Practical memory is recruited because present action requires it: a recorded measurement must be recalled, an instruction followed, a tool located, or a previous test compared with the current result. The memory is retrieved, applied, and released.*
> *Recursive memory follows a different trajectory:*

event remembered -> meaning for the virtual self evaluated -> related injuries or achievements recruited -> future consequence projected -> further memory activated.

The framework predicts selective reduction of the second trajectory without loss of the first. Reduced autobiographical rumination accompanied by preserved accurate recall would fit the proposal more closely than broad memory impairment.

Language should likewise remain available for communication, explanation, reasoning, and practical coordination. A reorganized individual should understand speech, produce coherent sentences, describe events, answer questions, reason verbally, communicate plans, and use conventional self-reference. Statements such as "I remember that," "I made an error," or "I will return tomorrow" can function as practical indexing to a particular organism, history, or commitment. [96, 97, 99, 102]

The empirical question is not whether personal pronouns disappear, but whether linguistic self-reference automatically reinstates the ontological organization of an independent thinker, owner, evaluator, or controller. Reduced psychological ownership should not require unusual speech, avoidance of pronouns, or loss of narrative competence. Conventional language can remain intact while the virtual reference point no longer possesses its former governing authority.

15.20.4 Demand-responsive task performance

Task performance should remain intact wherever practical cognition is required. The organism should follow instructions, maintain task-relevant attention, perform learned procedures, monitor error, adjust behaviour, and complete goal-directed activity. Reduced irrelevant cognition may potentially improve some forms of performance by decreasing distraction, anxiety-driven interference, repetitive self-monitoring, and competition from spontaneous autobiographical thought. This remains a prediction rather than an established consequence. [68, 97–99, 102, 149, 203]

A demanding task may require prolonged cognition. Duration alone is therefore insufficient to classify thought as unnecessary recursion. A complex scientific, mathematical, engineering, or craft problem may recruit sustained memory, comparison, simulation, and correction for hours while remaining coupled to an actual unresolved requirement. The demand-responsive sequence is:
actual task requirement -> cognition recruited -> relevant memory and comparison -> action -> error monitoring and correction -> completion -> cognition terminates.

The predicted transformation becomes visible when the requirement ends. Task-related cognition should be capable of terminating rather than automatically converting into unrelated association, self-evaluation, status concern, or prolonged narration about the result.

15.20.5 Planning and practical projection

Planning requires memory and projection. The organism must sometimes represent appointments, material requirements, travel routes, financial obligations, possible consequences, weather-related preparation, or the steps required to complete a project. The framework does not oppose future projection as such. It distinguishes practical projection from psychological becoming. [9, 10, 97–99, 163, 165]

Practical planning responds to an actual future requirement: relevant conditions are represented, actions are organized, and cognition terminates until further action is required. Psychological becoming instead represents the present self as inwardly incomplete, projects an ideal future self, and sustains comparison and desire. The first remains necessary; the second loses authority where its generating organization has been constrained. Preserved planning is therefore required to distinguish selective reorganization from impairment.

15.20.6 Problem-solving and evaluation

Problem-solving should remain intact. The organism should continue to identify discrepancies, generate possible explanations, compare alternatives, test predictions, learn from error, and revise action. Insight does not eliminate evaluation. It constrains the false division in which evaluation is attributed to an independent psychological judge standing outside the movement being evaluated. [68, 97–99, 149, 203]

Practical error detection can identify that a result does not meet a requirement, a joint is weak, an explanation conflicts with evidence, an action caused harm, or a plan requires revision. Such evaluation can recruit correction without becoming condemnation of an independent self. The contrast is:
Practical error detection: outcome differs from requirement -> cause investigated -> correction made.
Recursive self-condemnation: outcome differs from an ideal -> meaning attributed to the virtual self -> identity defended or condemned -> past reconstructed -> future completion projected -> psychological conflict sustained.

Preserved problem-solving together with reduced self-condemnation would support selective reorganization. A general inability to evaluate error would not.

15.20.7 Learned skill and practical individuality

Learned motor, perceptual, professional, and social skills should remain available because the organism's accumulated biological history is not erased. A musician should retain technical ability, a driver practical competence, a craftsperson perceptual and motor expertise, a scientist methods of analysis, and an individual ordinary social and linguistic skills. Their preservation is consistent with the claim that the virtual narrator is not the fundamental biological source of skilled performance. [68, 96, 203]

Insight may alter the psychological organization surrounding performance without eliminating the capacity itself. Skilled action can proceed with practical monitoring while unnecessary self-referential interference diminishes. Questions concerning how the performance proves personal value, how others will judge it, or what failure would mean about the self need not accompany the task. The learned skill remains; its appropriation by psychological identity is reduced.

15.20.8 Preserved response to actual danger

The organism must remain capable of responding to real threat. An approaching vehicle should recruit immediate movement, a fire escape or protective action, a structural failure attention and correction, a threatening animal defensive preparation, and pain withdrawal and protection. The framework does not equate fear with psychological error. Biological fear is an adaptive organism-relative response. [23, 27, 28, 56]

> *The predicted change concerns recursive continuation after the threat has ended, or where thought repeatedly recreates threat without new evidence. The distinction can be stated as:*
> *Actual danger: threat registered -> autonomic and cognitive resources recruited -> protective action -> danger resolves -> response gradually terminates.*
> *Psychological anxiety: threat represented or remembered -> ownership and future projection -> internally generated content renews threat -> autonomic activation persists -> psychological time continues.*

A reorganized organism should retain the first sequence while showing reduced unnecessary continuation of the second. Failure to respond appropriately to actual danger would not support choiceless awareness and could instead indicate impairment, dissociation, reduced salience, or another pathological condition.

15.20.9 Selective flexibility rather than global quieting

The central empirical signature should be selective cognitive flexibility. When no actual requirement is present, unnecessary thought should arise less frequently, residual thoughts should produce shorter chains, autobiographical and anticipatory elaboration should be reduced, and silence should return naturally. When an actual requirement appears, attention should orient, relevant memory should become accessible, cognition should be recruited, planning and problem-solving should function, and appropriate action should occur.

The flexible trajectory is:

> *silence -> actual demand -> cognition -> resolution -> silence.*

This differs from generalized cognitive quieting, in which reduced thought is accompanied by reduced responsiveness, impaired memory or planning, slowed action, and diminished task performance. The framework predicts efficient movement from silence into thought, from thought into action, and from completed action back into silence. The relevant change is not simple reduction but improved fit between cognitive recruitment and actual demand.

15.20.10 Potential empirical measures

Preserved L1 and practical cognition could be examined through convergent measures of wakeful responsiveness, sensory discrimination, reaction to unexpected relevant stimuli, working and long-term memory, language comprehension and production, planning ability, problem-solving accuracy, learned motor performance, task-switching, error correction, and response to real or simulated danger. These should be combined with measures of unnecessary cognition, including mind-wandering frequency, spontaneous autobiographical thought, cognitive-chain length, self-referential elaboration, rumination, future projection without practical demand, and recovery after task completion. [30, 68, 96–99, 102, 136, 149, 201, 203]

The predicted profile is preserved or potentially improved practical function together with reduced unnecessary recursive occupation. A participant who reports fewer spontaneous thoughts while showing impaired memory, reduced vigilance, slowed response, or diminished task performance would not provide clean support. A participant who retains or improves practical performance while unnecessary cognitive trajectories become shorter and terminate more readily would provide a more relevant pattern.

15.20.11 Distinguishing reorganization from suppression

Suppression can also reduce reported thought while preserving some task performance. The distinction lies in effort, conflict, and rebound. Suppression judges a thought unacceptable, recruits inhibitory effort, continues monitoring, and preserves the thought's relevance as an object of control. Choiceless awareness predicts that when no actual demand is present, little or no recursive gain occurs, no continuing opposition is required, and the thought dissolves. [68, 116, 149, 202]

Suppression may therefore involve effort, sustained tension, delayed recovery, rebound after control is released, and an elevated Friction Signature associated with internal conflict. Selective reorganization should show minimal opposition, rapid termination, low rebound, and preserved practical availability of cognition. [12, 13, 68, 116, 149, 202]

15.20.12 Distinguishing reorganization from dissociation, sedation, and anesthesia

Dissociation can reduce ownership or self-reference while also producing detachment, fragmentation, unreality, altered memory access, reduced emotional integration, or disconnection from bodily and environmental experience. Choiceless awareness predicts the opposite with respect to L1 presence. The organism should remain sensorially engaged, relationally available,

practically competent, responsive, and capable of acting according to actual conditions. Reduced self-reference accompanied by diminished integration or unreality requires a different explanation. [46, 47]

Sedation and anesthesia can reduce spontaneous cognition by diminishing the biological conditions supporting wakefulness, integration, memory, and report. Choiceless awareness predicts preservation of those conditions. Relevant discriminators include wakefulness, rapid response to significant stimuli, intact memory and language, preserved task performance, adaptive response to danger, and continued L1 phenomenology. The empirical inference cannot be that less thought necessarily indicates greater insight. The means of reduction and the capacities preserved must be specified. [38–40, 73–75]

15.20.13 Scientific and falsification obligations

The claim of preserved L1 and practical cognition would be weakened if extensive insight into conditioned continuity consistently produced impaired memory, reduced language capacity, poor task performance, loss of planning ability, slowed response to danger, diminished sensory registration, or generalized cognitive reduction. Such outcomes would be more consistent with suppression, impairment, altered arousal, or another change in biological capacity.

The claim would also be weakened if practical cognition could be preserved only through continuous internal effort while unnecessary thought returned immediately when control relaxed. It would receive support from a selective pattern in which primary phenomenology and organismic responsiveness remain intact; memory, language, planning, problem-solving, learned skills, and adaptive danger response remain available; unnecessary self-referential cognition is reduced; residual thoughts terminate rapidly; and cognition naturally ends when the practical requirement has been resolved.

The governing prediction is therefore that insight into the self-generating movement and conditioned cognitive continuity should reduce unnecessary recursive occupation without producing generalized loss of brain function. L1 organism-relative phenomenology, sensory registration, memory, language, practical thought, learned skill, and adaptive response to actual conditions should remain biologically available.

In compressed form: less unnecessary cognition, not less phenomenology; not less intelligence; not less practical capacity; and not less biological responsiveness. The organism remains capable of thought. Thought no longer operates as its compulsory ongoing occupation.

15.21.0 Insight into the Self-Generating Movement

Insight into the self-generating movement should produce consequences distinguishable from both conceptual acceptance of self-construction and generalized suppression of cognition. The predicted change is not disappearance of memory, language, autobiographical information, evaluation, or conventional self-reference. It is loss of governing authority of the virtual reference point as an independently existing thinker, observer, evaluator, controller, owner, and sufferer. [5–7, 20, 69, 195–199]

The target is a specific recursive organization: thought operating through psychological time recruits organism-relative evaluation, generates a virtual reference point, attributes cognition and experience to that reference point, and then treats the generated reference point as the independent author and owner of the process. Where this organization has been extensively perceived and constrained, self-related representations may remain functionally available while becoming drastically less capable of recruiting prolonged ownership, defence, comparison, psychological becoming, and conflict.

The empirical focus should therefore remain on trajectory rather than on the mere presence or absence of self-reference. A personal memory may arise, the word “I” may be used, a social role may be recognized, and criticism may be registered. The relevant questions are whether such content becomes organized as a threat to an independent “me,” recruits autobiographical defence, generates an evaluator opposed to the evaluated event, projects injury or completion through psychological time, sustains autonomic and metabolic amplification, or recruits further self-referential thought. The proposed reorganization should be inferred from these functional consequences rather than from doctrinal report alone. [11–13, 21, 56, 57, 69, 114, 119]

15.21.1 Drastically Reduced Self-Protective Narration

One candidate consequence is a marked reduction in self-protective narration: the recursive reconstruction through which an event is interpreted, defended, justified, rehearsed, or projected according to what it means for the virtual reference point. Criticism of work, for example, can become the beginning of an extended narrative concerning competence, status, intention, reputation, and the imagined judgement of others. Such narration may contain accurate facts, yet its dominant recursive function is to protect, repair, explain, or reassert the psychological centre. [11–13, 21, 56, 57, 69, 114, 119]

Where the self-generating organization has been extensively constrained, criticism may still be evaluated practically. The organism can determine whether the criticism is accurate, whether an error exists, whether clarification is required, and what correction is appropriate. The practical issue can be resolved without recruiting an extended narrative concerning the value, continuity, status, or security of an independent self.

The contrast can be expressed schematically:

Self-protective organization: event -> ownership -> threat to identity -> autobiographical defence -> projected social consequence -> continued narration.
Constrained organization: event -> practical significance registered -> relevant evaluation or correction -> response terminates when the issue is resolved.

A drastic reduction does not imply absolute absence of explanatory thought. An organism may need to explain an action, respond to a false accusation, establish a boundary, or correct misinformation. The predicted reduction concerns narration whose principal function is to stabilize, justify, protect, or restore the virtual psychological entity.

15.21.2 Reduced Rumination

Rumination provides a direct test of the proposed mechanism because it illustrates how the apparent owner and evaluator sustain psychological time. A memory, mistake, injury, or uncertainty is repeatedly reconstructed; each reconstruction generates further evaluation, projected consequence, self-condemnation, or attempted repair. The process can resemble problem-solving even when no new information is obtained and no practical resolution becomes more available. Thought continues because its own products remain relevant to the self it repeatedly regenerates. [12, 13, 21, 119]

Where the self-generating organization has lost authority, the same memory may remain accessible without producing the same recursive trajectory. A mistake can be recalled, its practical consequence assessed, and a correction identified. Cognition can then terminate. The memory no longer requires repeated reconstruction as evidence about an independent psychological owner.

The candidate prediction is therefore not merely lower reported rumination. It is a measurable reduction in reactivation frequency, average chain length, autobiographical elaboration, self-condemnation, future projection, and the probability that one reconstruction recruits another. Residual thought may occur without becoming a prolonged ruminative episode: memory remains while recursive ownership and continuation are drastically reduced. [12, 13, 21, 119]

15.21.3 Reduced Evaluator-Evaluated Conflict

Insight into the self-generating movement should also reduce the false division between evaluator and evaluated. Before reorganization, an emotional or cognitive event can be divided into the event itself and an apparent internal authority judging, opposing, condemning, or attempting to control it. Fear generates a controller that attempts to eliminate fear; shame generates an internal judge; desire is compared with an ideal; and a thought is monitored as though another entity stood outside cognition and assessed whether it should have occurred. [68, 69, 116, 149, 202]

Direct perception reveals that the evaluator-response is itself generated from memory, conditioning, comparison, fear, desire, and projected outcome. It is not outside the evaluated movement. Where this relation has been constrained, a primary response should be less likely to generate a second opposing psychological centre. Fear may be registered without an independent controller condemning it; sadness may occur without an internal authority demanding immediate non-sadness; and a mistake may be recognized without constructing a psychologically defective owner.

The candidate consequence is therefore reduced recursive conflict rather than absence of evaluation. Practical evaluation remains, while the false psychological evaluator loses authority. Empirically, this may appear as less internal opposition and self-monitoring, fewer conflict-related thoughts, shorter recovery following error, and reduced physiological amplification associated with condemnation and control. [12, 13, 68, 116, 149, 202]

15.21.4 Reduced Autobiographical Defence

Autobiographical memory supplies continuity to the virtual reference point. When a present event appears threatening, thought may recruit a wider personal history to defend, explain, or validate the self. A disagreement can activate earlier occasions of being misunderstood; criticism can recruit memories of prior achievement; a social slight can recall a history of rejection; and a challenge to a belief can activate the identity organized around having held and defended it. The present event is then embedded within a larger narrative of continuity and threat. [5–7, 11, 69, 114, 119]

The autobiographical content may be factually accurate. The proposed change concerns its automatic recruitment for defence of the virtual reference point. Where the self-generating movement has been constrained, autobiographical memory should remain available when practically relevant while becoming less likely to operate as an identity-preserving instrument.

Present challenge -> broad autobiographical defence -> identity reinforced -> prolonged conflict.
Present challenge -> relevant facts retrieved if required -> practical response -> no unnecessary extension into identity defence.

This prediction must be assessed across contexts. Autobiographical defence may be reduced in one domain while remaining active in another. Little defence concerning professional criticism together with continued defence of a relational injury or moral identity would indicate limited scope rather than global absence of reorganization.

15.21.5 Reduced Self-Security Recruitment

The virtual reference point repeatedly seeks stability through belief, status, relationship, possession, achievement, reputation, group identity, certainty, or projected future transformation. These forms of psychological self-security are recruited whenever the apparent continuity or value of the self is threatened. A challenge is interpreted as threat to the virtual reference point; securing content is recruited; belief, status, reassurance, or imagined completion provides temporary stabilization; and vulnerability returns when the securing content changes.

Insight into the self-generating movement should reduce the authority of this sequence. Practical security remains necessary: the organism may require shelter, income, reliable relationships, medical care, and protection from actual danger. The candidate consequence concerns reduced use of psychological content to stabilize an entity that is itself continually regenerated.

Possible manifestations include less compulsive reassurance seeking, less identity defence, reduced dependence on agreement or approval, less psychological investment in status, less projection of future completion, and less distress when a self-description is

contradicted. These consequences do not imply indifference to work, relationship, truth, or responsibility; those can retain practical and organismic significance without becoming structures through which an independent psychological self must be made permanently secure.

15.21.6 Reduced Autonomic Amplification

Self-referential interpretation can amplify and prolong organismic activation. A criticism, memory, uncertainty, or social cue may produce an initial response. Thought then organizes the event around the virtual reference point by asking what it means about the self, how the self must defend itself, what may happen later, and how security can be restored. Each recursive cycle can renew threat, discrepancy, or anticipated reward and thereby sustain autonomic recruitment. [11–13, 21, 69, 119, 120]

Where the self-generating organization has been constrained, immediate activation may remain. The predicted change concerns secondary amplification:

Constrained trajectory: self-relevant cue -> brief organismic response -> practical significance registered -> little autobiographical ownership or defensive projection -> rapid recovery.

Unconstrained trajectory: self-relevant cue -> ownership -> threat to identity -> defensive narration -> repeated projection -> sustained autonomic activation.

Candidate measures include heart-rate variability, skin conductance, respiration, muscular tension, sympathetic-parasympathetic balance, and recovery following self-relevant challenge. The strongest prediction concerns temporal shape. A lower peak is possible but not required; a similar initial response followed by rapid termination would also fit the architecture. Duration, recursive reactivation, coupling with self-defensive cognition, and delay in recovery are more informative than peak response alone. [11–13, 120]

15.21.7 Shorter Psychological-Conflict Trajectories

The preceding consequences converge on a general temporal prediction: psychological-conflict trajectories should become drastically shorter. Before reorganization, an event can be appropriated by the virtual self, divided into evaluator and evaluated, embedded in autobiographical defence, compared with an ideal or projected completion, and amplified autonomically until further self-referential thought renews the conflict. After extensive reorganization, organism-relative significance is registered, practical response occurs where required, residual self-reference may arise, little recursive gain follows, and the trajectory terminates rapidly.

This prediction should be operationalized through more than reports of peace or nonattachment. Relevant measures include the number of thoughts following a self-relevant cue, duration of self-referential cognition, probability of later reactivation, extent of autobiographical recruitment, behavioural defence, physiological recovery, and metabolic duration. A strong initial response is compatible with the account; the decisive issue is whether that response becomes a prolonged psychological trajectory. [12, 13, 21, 119, 120]

15.21.8 Altered Self-Referential Network Dynamics

Insight into the self-generating movement may also be associated with altered dynamics in the default mode network and other systems involved in autobiographical memory, self-referential evaluation, internally generated cognition, salience, and control. This prediction requires caution. The framework does not identify the self with the default mode network, and it does not predict a simple permanent reduction in default-mode activity under every condition. Autobiographical retrieval, future planning, social understanding, and memory integration remain biologically useful and may appropriately recruit these systems. [14, 21, 35, 36, 69, 119, 201]

The more defensible prediction concerns altered temporal and functional organization. Where self-referential recursion was previously sustained, candidate changes may include shorter duration of self-related network recruitment, lower probability that autobiographical processing develops into prolonged narration, altered coupling among default-mode, salience, and control-related systems, reduced reactivation following self-relevant cues, less persistence after practical resolution, and more flexible transition between internally directed cognition and present sensory engagement. [14, 21, 35, 69, 119, 201]

The predicted change is not disappearance of default-mode activity. It is reduced persistent recruitment of default-mode and related processes for unnecessary ownership, defence, comparison, and psychological becoming. A self-relevant task may still produce appropriate activation; what should be reduced is extended activity after the relevant information has been processed. Temporal trajectory is therefore more informative than one average activation value.

15.21.9 Lower Metabolic Cost of Sustained Self-Referential Recursion

Sustained self-referential processing requires biological energy. Repeated memory retrieval, autobiographical simulation, conflict monitoring, threat projection, autonomic coordination, and network reactivation contribute to the broader Friction Signature. If insight reduces unnecessary self-referential continuation, the framework predicts a corresponding reduction in the metabolic cost of sustaining those trajectories. [16, 33–35, 42, 118–121]

The prediction is selective rather than global. Present perception, language, learning, planning, skilled action, and difficult practical work remain energy-dependent and may recruit substantial neural and bodily resources. The candidate consequence is lower metabolic expenditure associated with unnecessary recursive self-processing after the actual requirement has ended.

Possible measures include the duration of glucose utilization associated with the trajectory, oxygen consumption, cerebral blood-flow changes, network-specific activity duration, local heat production, autonomic metabolic cost, and total recovery time following self-relevant challenge. The contrast can be stated as: [16, 33–35, 42, 44, 118–121]

Ordinary trajectory: cue -> self-ownership -> autobiographical continuation -> defensive projection -> recurrent network recruitment -> sustained autonomic and metabolic cost.
Constrained trajectory: cue -> practical or organismic registration -> little self-defensive continuation -> rapid termination -> reduced metabolic extension beyond actual demand.

The framework does not require every metabolic measure to decrease simultaneously or identically. The stronger prediction is that the complete sustained trajectory should fail to develop or should be drastically attenuated where the corresponding self-generating organization has been extensively constrained.

15.21.10 Convergent Candidate Profile

No individual consequence should be treated as proof of insight. Reduced narration can result from avoidance, reduced autonomic response from sedation, lower default-mode activity from demanding external tasks, and reduced reports of suffering from suppression or social expectation. A stronger candidate profile requires convergence across several domains. [36, 38–40, 46, 47, 68, 73–75, 116, 149, 202]

Such a profile would include substantially reduced self-protective narration; shorter and less frequent rumination; less recruitment of the evaluator-evaluated division; reduced autobiographical defence and self-security seeking; more rapid autonomic recovery; shorter psychological-conflict trajectories; less persistent and more flexible self-referential network activity; and metabolic recruitment that does not continue substantially beyond actual demand. At the same time, L1 phenomenology, memory, language, practical evaluation, social responsibility, and task-relevant cognition should remain intact. This selective pattern distinguishes the proposed reorganization from generalized reduction in cognition.

15.21.11 Alternative Explanations

The candidate profile must be distinguished from suppression, avoidance, emotional numbing, learned reappraisal, dissociation, sedation, fatigue, social conformity, and deliberate performance of an expected selfless identity. Suppression may reduce verbal expression while preserving internal monitoring and conflict. Avoidance may prevent the relevant organization from being recruited. Emotional numbing may reduce both psychological conflict and appropriate affective response. Learned reappraisal may require repeated application of a corrective strategy. Dissociation may reduce ownership through impaired integration, and sedation may reduce cognition and autonomic activation globally. A spiritual or philosophical identity may produce claims of nonattachment while self-protective organization remains active under challenge. [38–40, 46, 47, 68, 73–75, 116, 149, 202]

Insight into the self-generating movement should instead show preserved present phenomenology, appropriate practical response, reduced recursive ownership, little need for continuous correction, rapid termination following residual activation, and stability across the contexts in which the constrained organization had previously operated.

15.21.12 Falsification Conditions

The candidate account would be weakened if claimed insight produced only altered language while self-protective narration remained unchanged, rumination retained the same duration and recurrence, autobiographical defence remained equally strong, the evaluator-evaluated division repeatedly regained authority, self-security continued to dominate behaviour, autonomic amplification remained equally prolonged, and self-referential network and metabolic trajectories showed no selective alteration.

It would also be weakened if reduced self-reference were consistently accompanied by impaired memory, diminished emotional integration, poor task performance, reduced responsiveness, or global cognitive suppression. Such findings would be more consistent with impairment, suppression, altered arousal, or another mechanism than with selective recursive reorganization.

The claim would receive support from a selective pattern in which the virtual reference point loses governing authority without loss of practical cognitive capacity. Where the self-generating movement has been extensively perceived and constrained, self-related representations may remain available, but they should be drastically less capable of recruiting prolonged ownership, defence, comparison, psychological becoming, and self-security. The resulting trajectory should involve less self-protective narration, shorter psychological conflict, reduced autonomic and metabolic amplification, and altered temporal organization of self-referential network activity.

15.22.0 Insight into the Conditioned Continuity of Cognition

Insight into the conditioned continuity of cognition generates a related but distinct empirical profile from insight into the self-generating movement. The principal target is not the self-related content around which thought is organized, but the recruitment process through which one internally generated cognitive event acquires sufficient organism-relative relevance to produce another after no practical, organismic, or environmental requirement remains unresolved. The candidate mechanism is recursive: a thought arises, its content becomes an internal stimulus, discrepancy or possibility is registered, memory or projection is recruited, a new representation appears, and that representation acquires renewed relevance. Cognition thereby continues through consequences of its own prior activity.

This loop need not contain explicit self-reference in every cycle. Insight into the self-generating movement may reduce ownership, defence, psychological becoming, and self-referential suffering while spontaneous association, imagery, prediction,

and internally generated cognition remain biologically available. Insight into conditioned continuity concerns whether these capacities are automatically reinitiated and prolonged in the absence of an actual unresolved demand. Where the recruitment organization has been extensively constrained, thought should remain available while becoming less compulsively self-propagating. The predicted change concerns initiation, transition, continuation, termination, and return to silence rather than permanent absence of thought.

15.22.1 Spontaneous Initiation Without Indiscriminate Pathologizing

One candidate consequence is a reduction in the frequency with which non-demand-responsive cognitive trajectories begin. This prediction requires careful qualification because spontaneous cognition is not inherently unnecessary. An apparently spontaneous thought may identify an unfinished obligation, expose a relevant danger, integrate prior learning, generate a useful design, or contribute to creative exploration. The framework therefore does not classify every internally generated event as pathological or purposeless. [98, 99, 201]

The target is cognition whose continuation is sustained primarily by its own products after no actual requirement remains unresolved. Examples may include repeated imagined dialogue after no action is possible, rehearsal of a completed interaction, reconsideration of a settled decision without new evidence, threat simulation that produces no additional preparation, or associative continuation with no identifiable practical, learning, or organismic function within the relevant context. Following extensive reorganization, such trajectories should be initiated less often because internally generated content no longer automatically acquires the same recursive relevance. The prediction is probabilistic: an unnecessary thought may still arise through retained pathways, but it should be less likely to initiate a prolonged chain.

15.22.2 Transition Probability and Associative-Chain Length

The most direct prediction concerns the conditional probability that one unnecessary thought recruits another. Before reorganization, a thought can produce an association, discrepancy, or possibility; that product becomes relevant; and a subsequent thought is recruited. After reorganization, the same initial thought may arise, but the absence of an unresolved demand is registered and no recursive gain follows.

The contrast can be represented schematically:

Before reorganization: thought A -> internally generated relevance -> thought B -> renewed relevance -> thought C -> continued chain.
After reorganization: thought A -> actual present relevance registered -> no unresolved demand -> no recursive gain -> termination.

The central variable is therefore not only thought frequency but the probability of transition from one non-demand-responsive thought to the next. The framework predicts a substantial reduction in:

P(next unnecessary thought | current unnecessary thought)

This reduction should produce shorter spontaneous associative chains. A word fragment may ordinarily recruit a remembered conversation, imagined response, social evaluation, future scenario, another memory, comparison, and further projection. Following extensive reorganization, the initial representation may occur without generating the remainder of the trajectory. The measurable profile should include fewer transitions, shorter episode duration, less thematic elaboration, lower recurrence of the same chain, and reduced movement into autobiographical or anticipatory content. [9, 10, 97–99, 201]

The claim applies only where no actual unresolved requirement is present. A difficult practical, scientific, creative, or interpersonal problem may require a long and internally generated sequence. Duration alone cannot classify cognition as unnecessary; the relevant issue is whether continuation remains functionally coupled to a demand and can terminate when that demand is resolved. [68, 97–99, 201, 203]

15.22.3 Effortless Silent Intervals

If unnecessary initiation becomes less frequent and associative chains shorten, intervals without psychological time should become more frequent and longer. These intervals should arise without continuous concentration, monitoring, suppression, mantra repetition, environmental withdrawal, or an internal command to remain silent. Where no actual demand is present, cognition is not recruited, organism-relative phenomenology remains, and the interval is silent. When a residual thought occurs, it should fail to acquire recursive gain, dissolve, and be followed by renewed silence.

The distinction is between effort-maintained silence and silence arising from the absence of unnecessary recruitment. Effort-maintained silence may involve monitoring, correction, internal conflict, physiological tension, dependence upon a method, and rebound when control is relaxed. Effortless silence should involve little opposition, rapid return following a residual thought, preserved responsiveness, and no requirement for a continuous controller. This provides the empirical bridge between insight into conditioned continuity, meditation as a silent interval, and choiceless awareness as attention arising from reorganized recruitment conditions. [68, 116, 149, 202]

15.22.4 Selective Autobiographical and Anticipatory Recruitment

Autobiographical memory and future simulation remain adaptive where they serve an actual requirement. A present decision may require recall of previous outcomes; a future task may require planning; and a social obligation may require anticipation. The candidate change concerns their recruitment outside such demand. A minor internal cue should become less likely to produce

extended reconstruction of personal history, imagined judgement by others, rehearsal of past conversations, projection of hypothetical threat, simulation of personal success or failure, or comparison between a present and idealized future self. [5–10, 69, 201]

The distinction can be stated as:

> Demand-responsive recruitment: actual requirement -> relevant autobiographical or anticipatory cognition -> resolution -> termination.
>
> Unnecessary recruitment: internally generated cue -> autobiographical or anticipatory content -> renewed self-generated relevance -> prolonged cognition without present resolution.

Following reorganization, autobiographical and anticipatory systems should remain fully available but become less readily recruited by content that possesses no present practical significance. The predicted result is selective temporal flexibility, not a global reduction in memory, simulation, or imagination.

15.22.5 Residual Thought and Natural Dissolution

Historically conditioned pathways may continue to produce old images, verbal fragments, worries, or memories. The framework does not predict immediate erasure of every association. It predicts a change in what follows. Where no actual demand exists, the arising content should receive little recursive gain, fail to recruit autobiographical continuation or internal dialogue, and dissolve rapidly. [94, 96, 101, 203]

No independent chooser needs to classify the thought as useless. Deliberate rejection would preserve its relevance by recruiting evaluation, suppression, redirection, and monitoring. Natural dissolution has a different organization: [68, 116, 149, 202]

> Deliberate rejection: thought arises -> evaluator judges it unacceptable or useless -> control is applied -> monitoring continues -> thought remains relevant.
>
> Natural dissolution: thought arises -> no actual demand is present -> no recursive amplification occurs -> no subsequent thought is recruited -> silence.

The empirical distinction should appear in lower effort, reduced rebound, shorter physiological activation, and lower probability of delayed reactivation. Absence of further recruitment is the functional expression of the thought's lack of sufficient present relevance to sustain continuation. [12, 13, 68, 116, 149, 202]

15.22.6 Termination Following Practical Resolution

Insight into conditioned continuity should also alter the boundary between useful cognition and its unnecessary continuation. A real task may recruit sustained planning, comparison, correction, and action. Once the task is complete, however, cognition can ordinarily continue through rehearsal, self-evaluation, imagined alternatives, anticipation of praise or criticism, or unrelated association. The practical requirement ends, but the cognitive trajectory remains active. [68, 97–99, 203]

Following reorganization, cognition should terminate more readily when the requirement has been resolved:

> actual problem -> cognition recruited -> planning, comparison, action, and correction -> problem resolved -> no further demand -> cognition terminates -> silence.

This prediction does not require practical thought to become shorter while the task remains unresolved. Its critical test is the transition after resolution. Relevant measures include duration of post-task cognition, transition from task content into self-evaluation, time required to return to present sensory engagement, post-task mind wandering, and persistence of autonomic or metabolic recruitment after the task has ended. [68, 97–99, 149, 201, 203]

15.22.7 Attention Without Continuous Corrective Control

Where one unnecessary thought no longer readily produces another, attention should require less continuous redirection. Before reorganization, distraction may be detected, a corrective command generated, attention restored, and another distraction followed by renewed correction. After extensive reorganization, a residual thought may arise but fail to continue, leaving present registration intact without repeated supervisory intervention.

The predicted attentional profile includes less corrective effort, less conflict between attention and distraction, reduced monitoring burden, rapid recovery following interruption, and preserved capacity for sustained task-relevant attention. Attention becomes more stable not because one thought successfully controls every other thought, but because unnecessary transitions occur less frequently. This provides an empirical formulation of choiceless awareness as attention arising from altered recruitment conditions rather than continuous control. [68, 149, 202]

15.22.8 Preserved and Potentially More Efficient Practical Cognition

Preservation of task-relevant cognition is a necessary condition of the account. Insight into conditioned continuity should not produce generalized slowing, reduced working memory, impaired planning, diminished creativity, or loss of problem-solving capacity. When an actual requirement is present, cognition should remain capable of rapid recruitment, sustained operation, relevant association, comparison, simulation, error correction, and action. [68, 97–99, 201, 203]

Reduced competition from unnecessary cognition may improve some forms of performance through fewer irrelevant intrusions, less performance-related self-monitoring, more stable task engagement, faster recovery from distraction, and more efficient termination after completion. Such improvement remains a prediction rather than an assumption; preservation is the minimum

requirement. Fewer thoughts accompanied by impaired performance would instead be more consistent with fatigue, sedation, suppression, or cognitive dysfunction.

The predicted profile is therefore:

less unnecessary cognitive occupation, with intact or potentially improved demand-responsive cognition.

The key property is selective flexibility. The organism should move readily from silence into task-relevant thought, sustain cognition for as long as a real requirement persists, and return to silence when the requirement ends.

15.22.9 Immediate Reorganization and Longer-Term Stabilization

The proposed insight initially changes governing recruitment conditions. Longer-term biological stabilization may subsequently alter the probability that prior pathways are initiated or sustained. Each time an unnecessary thought arises without completing its former chain, the old trajectory is not reinforced in the same manner. Across repeated occurrences, candidate consequences may include lower salience assigned to non-demand-responsive internal content, reduced accessibility of associated autobiographical chains, lower transition probability among previously linked thoughts, less autonomic reinforcement, reduced initiation frequency, shorter network persistence, and greater stability of silence. [94, 101, 203]

The relationship can be represented as:

> direct perception of conditioned recruitment -> automatic continuation loses authority -> residual thought fails to recruit the former chain -> repeated non-reinforcement -> altered pathway weighting over time -> unnecessary initiation and continuation become less probable.

Insight changes the governing organization; neuroplastic processes may increasingly stabilize and embody that change. The precise implementation remains an empirical question and may involve functional connectivity, salience and relevance assignment, network-transition dynamics, memory accessibility, autonomic coupling, and metabolic reinforcement. The account does not require immediate structural pruning of prior pathways. Functional change may precede and guide longer-term stabilization. [94, 101, 203]

15.22.10 Temporal, Network, and Friction Signature Predictions

The predicted change should be expressed particularly strongly in temporal measures rather than in one average value from a single region or network. Informative variables include spontaneous-initiation frequency, transition probability between thoughts, duration and dwell time of internally generated episodes, time required to return to present sensory engagement, persistence of network states, coupling between cognition and autonomic activation, and continuation after practical resolution. [12, 13, 149, 201]

Candidate network consequences include less persistent internally directed activity when no demand is present, more flexible transition between internally and externally oriented processing, reduced coupling between spontaneous content and autobiographical elaboration, shorter dwell time in recursive cognitive states, and preserved recruitment of relevant systems during actual tasks. The framework does not predict permanent external orientation. Internally generated cognition remains useful for planning, memory integration, creativity, and simulation. The proposed change concerns compulsory occupation rather than existence of internal processing. [14, 35, 36, 69, 119, 201]

Unnecessary cognitive continuity can sustain a multidimensional Friction Signature even when explicit self-defence is minimal. Repeated recruitment requires continued neural activity, maintenance of ion gradients, metabolic support, network coordination, autonomic adjustment, and restoration of nonequilibrium conditions. Where one thought repeatedly recruits another, these costs accumulate. [16, 33–35, 42, 44, 118–121]

The candidate contrast is:

> Before reorganization: internally generated thought -> recursive relevance -> further cognition -> repeated network recruitment -> sustained metabolic and regulatory demand -> prolonged Friction Signature.

> After reorganization: residual thought may arise -> no recursive gain -> no extended network sequence -> rapid return toward baseline organization.

The prediction is not necessarily a large reduction in the initial energetic cost of one thought. It is a reduction in accumulated cost produced by repeated continuation. Relevant measures include total duration, area under metabolic or autonomic trajectories, number of reactivations, recovery time, and coupling among successive cognitive events. A similar initial event followed by a drastically shorter chain could therefore produce substantially lower total organism-level cost. [12, 13, 16, 33–35, 42, 118–121]

15.22.11 Alternative Explanations and Falsification

The predicted pattern must be distinguished from sedation, fatigue, cognitive impairment, task disengagement, avoidance, suppression, and low motivational state. Each can reduce thought frequency or chain length. The critical discriminator is preserved flexible demand-responsive cognition. Sedation reduces availability, fatigue slows performance, impairment diminishes memory or problem-solving, avoidance prevents relevant engagement, suppression requires effort and may produce rebound, and low motivation can reduce both necessary and unnecessary cognition. [38–40, 46, 47, 68, 73–75, 116, 149, 202]

Insight into conditioned continuity should instead show rapid recruitment when actual demand appears, accurate and sustained cognition while a task remains unresolved, natural termination after resolution, little effortful monitoring, and reduced unnecessary continuation when no demand exists. The profile should be selective and context-sensitive rather than globally quiet.

The account would be weakened if claimed insight produced no measurable change in spontaneous initiation, transition probability, associative-chain length, effortless silent intervals, autobiographical and anticipatory recruitment outside actual demand, post-resolution termination, or residual-thought persistence. It would also be weakened if reduced spontaneous cognition were accompanied by impaired performance, poor planning, slowed response, diminished creativity, memory loss, or generalized reduction in cognitive availability. Silence that depends continuously upon suppression, concentration, environmental isolation, or method-dependent control would not support the proposed reorganization.

Support would require a convergent pattern: fewer unnecessary initiations; lower probability that one non-demand-responsive thought recruits another; shorter spontaneous chains; longer effortless silent intervals; rapid dissolution of residual thoughts; less autobiographical and anticipatory recruitment without actual demand; readier termination after practical resolution; attention requiring less correction; preserved or improved task-relevant cognition; and increasing stability over time consistent with altered pathway weighting.

15.22.12 Relation to Insight into the Self-Generating Movement

Insight into the self-generating movement and insight into conditioned continuity should overlap but should not be treated as identical. The first predicts reduced authority of the virtual owner around which self-referential cognition is organized, with corresponding reductions in ownership, defence, self-security, psychological becoming, and evaluator-evaluated conflict. The second predicts reduced initiation, transition probability, chain propagation, recursive gain, and unnecessary continuation even where explicit self-reference is absent.

The central prediction can therefore be stated as follows: where the conditioned continuity of cognition has been extensively perceived and constrained, thought should remain fully available in response to actual practical, organismic, or environmental requirements, while internally generated content becomes drastically less capable of recruiting unnecessary continuation. Spontaneous chains should shorten, residual thoughts should dissolve rapidly, practical cognition should terminate more readily upon resolution, and silent attention should arise without continuous effortful control.

Together, the two proposed reorganizations predict a living organism in which primary phenomenology remains, practical cognition remains available, the virtual reference point no longer governs as an independent author, thought is recruited when required, cognition terminates when the requirement ends, and silence returns without effort, suppression, or an independently existing chooser.

15.23.0 Distinguishing Comparison Conditions

The empirical program must distinguish among conditions that can reduce thought, alter self-reference, change subjective report, or modify the organism's Friction Signature without sharing the same underlying mechanism. Reports of silence, reduced selfhood, unusual clarity, detachment from thought, loss of psychological time, increased present awareness, or diminished psychological suffering are scientifically relevant, but none identifies the process that produced the condition. Similar descriptions may arise from ordinary variation in spontaneous cognition, effortful concentration, temporary complete attention, conceptual belief, recursive reorganization, meditative absorption, psychedelic alteration, dissociation, sedation, or broader suppression of consciousness-capable biological organization. [36, 38–40, 43, 45–47, 59, 73–75, 149, 166, 167, 191–194, 200–202]

These conditions may overlap phenomenologically while differing in what initiates them, whether effort is required, whether practical cognition and L1 phenomenology remain available, whether the virtual self has lost governing authority, whether unnecessary thought has lost recursive gain, whether the change persists after the initiating condition ends, and whether it depends upon a method, substance, setting, or instruction. They may also differ in the temporal organization of cognitive, behavioural, autonomic, network, and metabolic activity. The empirical task is therefore not merely to identify reduced cognition or diminished self-reference. It is to determine the architecture producing the reduction.

The comparison set developed here includes ordinary spontaneous cognition, effortful concentration, temporary complete attention, conceptual belief that the self is constructed, insight into the self-generating movement, insight into the conditioned continuity of cognition, choiceless awareness, meditative absorption without demonstrated reorganization, psychedelic ego attenuation, dissociation, and anesthesia or another form of global suppression. The framework predicts that these conditions will not produce identical trajectories even when participants use similar language to describe them.

15.23.1 Ordinary spontaneous cognition

Ordinary spontaneous cognition provides the primary baseline. In this condition, internally or externally generated content can readily become the stimulus for further cognition. A sound, memory, sensation, image, word, discrepancy, or incomplete representation may acquire organism-relative relevance and recruit comparison, retrieval, prediction, or projection. The output of one cognitive movement becomes an input to the next, allowing a chain to continue without an immediately identifiable practical requirement. [9, 10, 97–99, 201]

Explicit self-reference may or may not appear. Spontaneous cognition can concern personal history, imagined conversations, future possibilities, unresolved practical matters, creative exploration, or semantically linked content with little autobiographical involvement. It is therefore broader than rumination and should not be treated as uniformly pathological. Its empirical profile is expected to show a broad distribution of initiation frequency, transition probability, chain length, autobiographical and anticipatory recruitment, and movement between internally and externally directed processing. Where content concerns threat,

injury, status, desire, or self-security, the trajectory may develop into sustained psychological recursion and a prolonged Friction Signature; where relevance is weak, it may terminate rapidly. [9, 10, 98, 99, 201]

The baseline sequence is:

internal or external cue -> memory, image, word, discrepancy, or possibility -> organism-relative relevance -> retrieval, comparison, or projection -> new internally generated content -> renewed relevance -> continued cognition.

15.23.2 Effortful concentration

Effortful concentration narrows cognition around a selected object or task through selection, inhibition, monitoring, and repeated correction. Competing content is detected, the intended goal is recalled, and attention is redirected. The apparent controller may be repeatedly regenerated as the one maintaining focus, resisting distraction, evaluating success, and attempting to preserve the desired state. [68, 149, 202]

A reduction in autobiographical wandering during concentration may therefore coexist with substantial cognitive and metabolic demand associated with task maintenance, conflict monitoring, inhibition, error detection, and corrective control. Concentration should not be classified as insight merely because thought becomes narrower or less variable. Its critical test is what occurs when effort is released. If the prior recruitment organization remains viable, competing cognition returns, spontaneous chains resume, and psychological time reappears. Dependence upon a selected object or goal, continuing corrective effort, fatigue, and restoration of the former pattern after control ends distinguish concentration from durable recursive reorganization. [16, 33–35, 42, 68, 149, 202]

The characteristic sequence is:

object or goal selected -> competing content inhibited -> distraction detected -> corrective effort recruited -> attention redirected -> selected object maintained.

15.23.3 Temporary complete attention

Temporary complete attention differs from concentration because it does not depend upon continuous selection, exclusion, or correction. Present organism-relative perception remains while active thought operating through psychological time is absent. No thought propagates another, no narrator evaluates the interval, and the interval is silent. This condition demonstrates that thought can cease without eliminating phenomenology or environmental responsiveness.

Complete attention is nevertheless a state-level description. It does not establish that the organization repeatedly reinstating thought has been durably altered. When the interval ends, a present or internally generated event may again acquire relevance, cognition may be recruited, and one thought may again produce another. The Friction Signature may therefore decline during the silent interval and return toward its prior organization when ordinary recruitment resumes.

The decisive evidence lies after the interval: whether thought returns with the same frequency, whether transition probabilities remain unchanged, whether autobiographical narration and psychological conflict resume, whether effort is required to recover silence, and whether the interval becomes an achievement to be remembered and pursued. Temporary silence can be genuine without constituting durable reorganization.

15.23.4 Conceptual belief that the self is constructed

Conceptual belief represents a change in knowledge. A participant may accurately explain that self-continuity depends upon memory, language stabilizes self-reference, narrator-mediated attribution is downstream, thought can precede explicit self-representation, and the apparent chooser need not be an independent causal agent. The central empirical question is whether this knowledge has altered the governing organization or has become content attributed to the same virtual reference point. [5–7, 20, 69, 195–199]

A self-relevant event may still recruit ownership or defence; the theory is then recalled; the reaction is interpreted or reappraised; and recursive self-reference continues. The participant may become highly skilled at describing the architecture while still experiencing injury as belonging to an independent owner, thought as authored by that owner, fear as something the owner must control, and transformation as a future achievement. Conceptual belief may alter report and deliberate regulation while leaving substantial portions of the prior autonomic, metabolic, and self-protective trajectory intact. [11–13, 21, 56, 57, 69, 116, 119]

Distinguishing variables include recurrence of the former self-organization, dependence upon conscious retrieval of the theory, corrective effort, self-protective narration, contextual return of identification, and persistence of the old Friction Signature. The theory may change what the participant says without proportionately changing what the organization can still govern.

15.23.5 Insight into the self-generating movement

Insight into the self-generating movement concerns direct perception of the operation through which thought functioning in psychological time generates the virtual reference point experienced as thinker, observer, evaluator, controller, owner, seeker, and sufferer. The candidate reorganization is not disappearance of memory, language, conventional self-reference, or practical evaluation. It is loss of governing authority of the virtual centre as an independently existing author and owner.

Self-related representations may therefore remain while becoming less capable of recruiting autobiographical defence, self-protective narration, comparison, psychological injury, future completion, evaluator-evaluated conflict, or prolonged self-security. Primary organismic response and practical evaluation should remain. What should be selectively reduced is the sustained trajectory generated by recursive ownership and defence.

The candidate sequence is:

direct perception of the generating relation -> independent self-authority becomes incoherent -> virtual reference point loses governing authority -> self-related representations may remain -> ownership, defence, becoming, and evaluator-evaluated conflict are reduced.

This condition should be distinguished from conceptual belief by the organism's spontaneous response under challenge. Relevant features include little need to retrieve or apply a theory, reduced self-protective continuation, rapid termination of residual defensive activation, preserved conventional use of personal pronouns, preserved practical cognition, and stability across the domains in which the generating movement has been constrained. [11–13, 21, 56, 57, 69, 119]

15.23.6 Insight into the conditioned continuity of cognition

Insight into conditioned cognitive continuity concerns direct perception of the recruitment process through which internally generated content acquires sufficient organism-relative relevance to produce further cognition after no actual unresolved demand remains. The target is transition and continuation rather than principally the self-related content around which cognition is organized.

An arising thought may still occur, but where no practical, organismic, or environmental requirement is present, it should receive little recursive gain and fail to recruit another thought. Candidate measures therefore include unnecessary-initiation frequency, the conditional probability that one unnecessary thought produces another, associative-chain length, duration of internally generated episodes, post-resolution continuation, effort required to return to silence, and gradual change in recruitment probability over time. [9, 10, 97–99, 149, 201]

The characteristic sequence is:

thought arises -> actual present relevance is registered -> no unresolved demand is present -> no recursive gain occurs -> no subsequent thought is recruited -> cognition terminates.

This condition is distinct from insight into the self-generating movement. Self-authority may decline while non-self-referential association remains frequent; conversely, spontaneous chains may shorten while some self-related organizations remain viable. Its Friction Signature prediction concerns reduced accumulated cost from repeated transitions, shorter network persistence, less autobiographical and anticipatory elaboration outside actual demand, reduced autonomic reinforcement, and lower metabolic burden of the extended chain, with preserved practical cognition.

15.23.7 Choiceless awareness

Choiceless awareness is the derived condition in which thought remains biologically available but does not operate compulsively through psychological time. It is not produced by a chooser continuously preventing thought. It follows when the virtual chooser no longer possesses independent authority, automatic unnecessary recruitment has been constrained, residual non-demand-responsive thought receives little recursive gain, and organism-relative phenomenology remains whenever no cognitive demand is present.

The defining pattern is flexible transition rather than continuous absence of thought:

silence -> actual demand arises -> cognition is recruited -> relevant thought operates -> requirement resolves -> cognition terminates -> silence returns.

A participant should retain rapid sensory orientation, memory retrieval, language, planning, sustained problem-solving, social responsiveness, and adaptive action. The Friction Signature should be relatively low during silent present awareness but fully capable of increasing when genuine task demand or biological response requires it. Absence of continuous effort, little corrective monitoring, rapid dissolution of residual unnecessary thought, no dependence upon an object or ritual, preserved phenomenology, and stability outside controlled contemplative conditions distinguish choiceless awareness from global quieting and method-dependent states. [23, 68, 96–99, 102, 136, 149, 203]

15.23.8 Meditative absorption without demonstrated reorganization

Meditative absorption may involve reduced spontaneous narration, intense attentional stability, altered bodily awareness, reduced environmental distraction, changes in affective tone, and temporary attenuation of explicit self-reference. Such a state may be profound and biologically distinctive, but it should not automatically be identified with insight. The decisive question concerns what occurs when the absorption ends. [36, 37, 43, 59, 149]

Where the prior self-generating and cognitive-recruitment organizations remain intact, ordinary self-reference, spontaneous cognition, and psychological conflict should return under their former conditions. The state may depend upon posture, environmental control, withdrawal from ordinary demands, breath regulation, mantra repetition, or prolonged attentional technique. During absorption, cognitive variability, autonomic regulation, and network organization may differ substantially from ordinary cognition, yet these changes do not establish durable loss of recursive authority. [36, 37, 43, 59, 149]

Relevant comparisons include recurrence after the session, dependence upon practice conditions, contextual stability in ordinary life, response to criticism, loss, uncertainty, and relationship, and restoration of the former psychological Friction Signature when the relevant trigger returns. Meditative absorption may expose the movement of thought or create conditions favourable to direct perception; it may also remain a temporary state without demonstrated reorganization.

15.23.9 Psychedelic ego attenuation

Psychedelic states can alter self-boundaries, autobiographical organization, salience, sensory integration, affective intensity, and narrator coherence. Reports may include ego dissolution, unity, timelessness, reduced ownership, or intensified present phenomenology. These states are important comparison conditions because ordinary self-reference may be attenuated while phenomenology and other forms of cognition remain vivid or intensified. [45, 166, 167]

Temporary ego attenuation during pharmacological alteration is not equivalent to insight into the self-generating movement. The initiating mechanism differs, and the ordinary self-organization may return as the drug effect resolves. The trajectory may involve pharmacological perturbation, altered network and salience dynamics, destabilization of ordinary self-reference, unusual phenomenology, and partial or complete return of the previous organization after the altered state ends. [45, 166, 167]

A psychedelic event may contribute to later reorganization if a causal relation is directly perceived and remains nonviable after intoxication. That possibility must be separated from state-dependent ego attenuation. Empirical questions include whether former self-authority returns after the substance has cleared, whether changes persist without pharmacological support, whether self-protective narration and unnecessary recursion decline across ordinary contexts, whether outcomes depend upon suggestion or integration practices, and whether practical cognition remains intact. The psychedelic Friction Signature may be complex rather than uniformly reduced: attenuation of ordinary self-reference can coexist with intensified sensory, affective, associative, autonomic, or metabolic activity. [45, 166, 167]

15.23.10 Dissociation

Dissociation may involve altered ownership, detachment, depersonalization, derealization, disrupted self-continuity, memory disturbance, or fragmentation of integration. Statements such as not feeling like a self, not experiencing thoughts as one's own, or feeling detached from thought can superficially resemble reports associated with insight, but the underlying organization may be substantially different. [46, 47]

Dissociation can weaken ownership because access, integration, or connection to bodily, affective, autobiographical, or environmental experience is disrupted. Insight predicts preserved and potentially less obstructed organism-relative presence while the independent owner loses authority; dissociation may involve diminished, fragmented, unstable, or estranged presence. The comparison should therefore examine quality of phenomenology, bodily and emotional integration, memory continuity, environmental responsiveness, unreality, functional impairment, and stability of practical cognition. [46, 47]

The contrast is:

Insight: experience remains fully present -> the independent psychological owner loses authority.
Dissociation: experience or integration is disrupted -> ownership may weaken because connection to the event is altered.

Reduced self-report in dissociation does not establish reduced recursive biological cost. Dissociation can coexist with high autonomic activation, shutdown, unstable arousal, or abrupt transitions, and therefore requires a distinct explanatory account. [46, 47]

15.23.11 Anesthesia and other global suppression

Anesthesia and other forms of global suppression provide a necessary lower comparison. Under sufficiently deep suppression, the biological conditions supporting integrated, reportable phenomenology and practical cognition are substantially disrupted. Thought, narration, self-reference, and psychological suffering may be absent or inaccessible, but their absence does not constitute insight. The mechanism is broad suppression of consciousness-capable biological organization rather than selective recursive reorganization. [38–40, 73–75, 191–194]

As integration returns, phenomenology, memory, responsiveness, and cognition recover. Choiceless awareness predicts a different profile: L1 phenomenology remains, wakeful responsiveness remains, memory and language remain available, practical cognition can be recruited immediately, and only unnecessary continuation is selectively reduced. Arousal, sensory responsiveness, memory formation, task performance, language, adaptive behaviour, and integrated phenomenology are therefore indispensable comparison measures. [38–40, 73–75]

The defining contrast is:

Global suppression -> less thought because the organism cannot fully support cognition.
Selective reorganization -> less unnecessary thought while the organism remains fully capable of cognition when actual demand appears.

The same caution applies to severe fatigue, sedative states, neurological impairment, and other conditions that broadly reduce cognitive availability. Reduced thought is informative only when the mechanism of reduction and the capacities preserved are specified. [38–40, 46, 47, 73–75]

15.23.12 Comparison across Friction Signature organization

The comparison cannot rely upon one measure such as average regional activity, total thought count, self-reported calm, or reduced self-reference. The Friction Signature must be treated as a multidimensional trajectory involving cognitive initiation, chain propagation, autobiographical recruitment, network persistence and coordination, autonomic activation, metabolic demand, recovery, practical responsiveness, and longitudinal stability. [12, 13, 16, 30, 33–35, 42, 44, 118–121, 149, 201]

Ordinary spontaneous cognition should show variable internally generated recruitment with ordinary transition probabilities. Effortful concentration may reduce distraction while increasing monitoring, inhibition, and control demand. Temporary complete attention may show silent present awareness followed by restoration of ordinary recruitment. Conceptual belief may alter report

and deliberate regulation while leaving the former self-organization substantially viable. Insight into the self-generating movement should selectively reduce ownership, defence, evaluator-evaluated conflict, and self-security. Insight into conditioned continuity should selectively reduce unnecessary initiation, transition probability, chain length, and continuation after practical resolution. Choiceless awareness should combine preserved phenomenology and practical cognition with low unnecessary occupation and flexible demand-responsive recruitment.

Meditative absorption may produce substantial state-dependent change without durable reorganization. Psychedelic ego attenuation may diminish ordinary self-organization while intensifying or redistributing other cognitive and biological activity. Dissociation may reduce ownership through disrupted integration or altered access. Anesthesia should reduce cognition and phenomenology broadly by suppressing the biological conditions required for both. [36, 37, 43, 45–47, 59, 73–75, 149, 166, 167]

The empirical distinction lies in the organization of the complete response: what is reduced, what remains available, what becomes amplified, what requires effort, what returns when the condition ends, and what remains stable across ordinary life. No single comparison is sufficient. The proposed architecture requires convergent differentiation across phenomenology, cognition, behaviour, autonomic regulation, network dynamics, metabolic demand, and longitudinal outcome.

15.24.0 Falsification Conditions

The framework must specify conditions under which its central claims would be weakened, revised, or rejected. Without such conditions, any outcome could be retrospectively redescribed as compatible with limited scope, residual pathways, incomplete perception, gradual stabilization, or unmeasured biological change. Those concepts are necessary to the architecture, but they cannot function as protective devices against disconfirming evidence. A scientifically useful account must risk failure.

The claims at issue are that conceptual knowledge and direct recursive reorganization are empirically distinguishable; direct perception can render a governing organization nonviable; the virtual reference point is generated within thought rather than standing as its independent author; insight into the self-generating movement should selectively reduce recursive ownership and psychological conflict; insight into conditioned cognitive continuity should reduce unnecessary initiation and propagation of thought; L1 phenomenology and practical cognition should remain preserved; and the corresponding Friction Signature should change selectively rather than through global suppression.

15.24.1 Conceptual knowledge and direct perception become indistinguishable

The distinction between knowledge acquisition and insight would lose explanatory necessity if conceptual instruction reliably produced the same durable transformation as the proposed direct perception. Appropriately matched participants who merely learn and accept that the self is constructed would need to show the same loss of self-referential authority, reduction in psychological suffering, contextual stability, decline in self-protective narration, reduction in unnecessary cognitive chains, autonomic recovery, metabolic attenuation, and longitudinal persistence as participants claimed to have undergone recursive reorganization.

One isolated case would not settle the matter because new information may occasionally expose an incompatible relation and precipitate reorganization. The stronger disconfirming result would be reliable equivalence across matched groups and measures, with no detectable difference in transition trajectory, effort, recurrence, or biological organization. In that case, direct perception would be redundant, incorrectly specified, or no more than an ordinary learning process.

15.24.2 Practical cognition deteriorates

The framework predicts less compulsory cognitive occupation without reduced practical cognitive availability. It would therefore be weakened if claimed insight consistently produced impaired memory, reduced language, poor planning, lower problem-solving accuracy, diminished sensory registration, inability to sustain task-relevant thought, slowed adaptive response, or reduced response to actual danger. Such a profile would be more consistent with global suppression, reduced arousal, fatigue, dissociation, neurological impairment, or another loss of biological capacity. [38–40, 46, 47, 68, 73–75, 96–99, 102, 203]

A modest change on one task would not be decisive because reduced self-monitoring could alter strategy, motivation, or speed-accuracy trade-offs. The stronger disconfirming pattern would be generalized and reproducible deterioration across practical domains accompanying the supposed reorganization.

15.24.3 The former organization regains unchanged authority

The framework allows old memories, bodily responses, representations, and conditioned pathways to reactivate. It does not permit the complete former organization to return unchanged while being classified indefinitely as residual activation. The disconfirming outcome would be restoration of the same self-interpretation, defensive or ruminative sequence, corrective effort, psychological conflict, autonomic amplification, and metabolic burden under comparable conditions. [94, 96, 101, 203]

Residual activation should be brief, attenuated, or unable to reproduce the former governing trajectory. Where unchanged authority repeatedly returns, the architecture must consider that the original reorganization was incomplete, the target was misidentified, the report was inaccurate, the irreversibility claim is false, or the proposed mechanism requires revision. It should not automatically select the explanation most favourable to itself.

15.24.4 Psychological suffering remains unchanged

The account links sustained psychological suffering to recursive ownership, evaluator-evaluated division, autobiographical defence, comparison, becoming, and self-security. It would be weakened if credible constraint of those organizations produced no corresponding change in rumination, psychological injury, future becoming, self-condemnation, self-protective narration, or conflict duration within the same domain claimed to have reorganized. [12, 13, 21, 56, 57, 69, 119]

This test must remain scope-matched. Constraint of one fear should not be expected to eliminate grief, physical pain, or anxiety sustained by another unconstrained organization. The disconfirming case is failure of the predicted change within the organization specifically claimed to have lost authority.

15.24.5 Conditioned cognitive continuity remains unchanged

Insight into conditioned continuity predicts fewer unnecessary initiations, lower transition probability from one non-demand-responsive thought to another, shorter chains, longer effortless silent intervals, less autobiographical and anticipatory recruitment outside actual demand, and more ready termination after practical resolution. The architecture would be weakened if credible insight produced no convergent change across these variables.

The account must also avoid defining every remaining thought as practical, creative, or unconsciously adaptive. Some apparently purposeless cognition may serve functions not available to introspection, but that possibility cannot be used to classify all observed continuation as necessary. Operational criteria must be developed for actual unresolved demand, task relevance, novel contribution, behavioural consequence, and termination after resolution. [201, 208]

15.24.6 Residual thought retains the former trajectory

Residual thoughts may arise through retained pathways, but they should receive little recursive gain where the relevant recruitment organization has been constrained. The framework would be weakened if they continued to produce the same associative-chain length, autobiographical elaboration, projection, autonomic amplification, metabolic duration, later reactivation, and recovery time as before. Residual activation cannot be defined solely by the participant's label; the trajectory must differ under comparable triggering conditions.

15.24.7 Predicted Friction Signature differences fail

The framework predicts that ordinary spontaneous cognition, effortful concentration, temporary complete attention, conceptual belief, direct reorganization, choiceless awareness, psychedelic alteration, dissociation, and anesthesia should not produce identical Friction Signature organizations. Failure of one biomarker would not be decisive because the signature is multidimensional and context-sensitive. Repeated failure across cognitive trajectory, autonomic measures, metabolic duration, network-transition dynamics, behaviour, and longitudinal stability would count against the architecture.

For example, if claimed insight and suppression consistently require the same control, monitoring, effort, physiological tension, and show the same rebound, the distinction between constraint and suppression would be weakened. If choiceless awareness and sedation produce the same loss of responsiveness, memory, language, task performance, and sensory integration, selective reorganization would not be supported. Repeated null findings cannot be moved into an indefinitely unspecified variable. [68, 116, 149, 202]

15.24.8 Insight cannot be distinguished from suppression

> *Suppression preserves the relevance of unwanted content by opposing it. Its characteristic sequence is:*
> *thought arises -> content is judged undesirable -> inhibition or redirection is applied -> monitoring continues -> rebound or renewed conflict remains possible.*

Insight predicts a different sequence:

> *conditioned activation arises -> the former organization lacks governing authority -> little or no recursive gain occurs -> continued monitoring is unnecessary -> activation terminates naturally.*

The model would be weakened if claimed insight consistently depended upon continuous inhibition, deliberate redirection, avoidance, maintenance of a competing thought, or effortful control, and disappeared whenever control relaxed. The distinction requires measurable differences in effort, conflict, rebound, monitoring, physiological load, and stability after control is removed. [68, 116, 149, 202]

15.24.9 Insight cannot be distinguished from suggestion

Candidate insight cannot be identified solely through language matching the doctrine participants have been taught. Reports such as “the thinker is thought,” “there is no chooser,” or “psychological time has ended” may be produced by authority, demand characteristics, spiritual or therapeutic context, identity, and social conformity. The empirical account requires measures less easily produced by verbal imitation: spontaneous response under challenge, contextual recurrence, thought-chain duration, behavioural defence, autonomic recovery, task performance, and longitudinal stability. [100, 207, 208]

If ideal doctrinal language is accompanied by unchanged biological and behavioural trajectories, or if the reported transformation disappears when demand characteristics are reduced, suggestion or learned performance becomes the stronger explanation. [207, 208]

15.24.10 Insight cannot be distinguished from catharsis

Catharsis can produce powerful relief, emotional release, reinterpretation, and temporary reduction in conflict. It should not automatically be classified as recursive reorganization. A cathartic event may be followed by reduced tension and altered report while the prior organization later returns. The distinction must be tested through contextual recurrence, persistence after the emotional state ends, and whether the same injury, identity, or defensive trajectory regains authority. [209]

Catharsis may coincide with or facilitate insight, but the mechanisms cannot be conflated merely because both occur during an emotionally intense event.

15.24.11 Insight cannot be distinguished from ordinary learning

Ordinary learning can alter belief, expectation, behaviour, association, skill, and physiological response. The additional category of insight is justified only if it explains a specific loss of governing viability rather than content competing with content. The distinction requires evidence that corrective effort is drastically reduced, the old organization fails to regain authority, and change generalizes according to the perceived structure rather than trained surface content. [94, 96, 101, 116, 203, 204]

If all observed effects are fully explained by factual learning, reinforcement, extinction, reappraisal, habit formation, or ordinary memory updating, then constraint through negation may be unnecessary as a separate explanatory category. Learning mechanisms may contribute biologically to reorganization; the question is whether the proposed architectural distinction adds measurable explanatory value. [94, 101, 116, 203, 204]

15.24.12 Insight cannot be distinguished from an altered state

A powerful altered state may produce silence, reduced narration, ego attenuation, unusual perceptual organization, or timelessness. The framework would be weakened if state-dependent change were classified as durable insight without testing whether the prior organization returns. [36, 43, 45, 146, 166, 167]

The comparison is:

State change: initiating condition present -> altered cognition and phenomenology -> initiating condition ends -> prior organization returns.
Recursive reorganization: governing relation becomes nonviable -> initiating event ends -> loss of authority persists.

Follow-up must therefore occur after drug action, meditative absorption, hypnosis, intense emotion, social ritual, or controlled environmental support has ended. Durability under ordinary and challenging conditions is essential. [36, 43, 45, 146, 166, 167]

15.24.13 Choiceless awareness is indistinguishable from global suppression

Choiceless awareness predicts preserved L1 phenomenology, sensory responsiveness, memory, language, task performance, adaptive behaviour, and immediate recruitment of cognition under actual demand. It would be disconfirmed by diminished wakefulness, cognitive slowing, impaired integration, memory failure, loss of task competence, or reduced responsiveness. Reduced thought cannot count as support if the organism's capacity to think has also been reduced. [38–40, 73–75, 96–99, 102]

15.24.14 The framework relies only on self-report

Self-report is indispensable because the theory concerns the inside view and cognitive organization, but it is insufficient. Reports are shaped by memory, language, expectation, identity, social context, and retrospective reconstruction. The architecture requires convergence with behaviour, practical performance, response to challenge, thought-transition measures, autonomic trajectory, metabolic or network organization, and longitudinal stability. If claimed insight has no observable consequence beyond testimony, the empirical content of the theory would be severely limited. [5–7, 96, 100, 102, 197–199, 207, 208]

15.24.15 Domain specificity and structural generalization fail

The framework predicts that reorganization should generalize according to the structure perceived. A narrowly constrained fear may change in one domain while unrelated organizations remain; a broad perception of the self-generating movement should generalize across different contents that instantiate the same recursive architecture.

The account would be weakened if observed change related neither to the specified target domain nor to the common structure claimed to have been perceived. Scope must not become unfalsifiable through retrospective claims that every contradiction belongs to another unperceived domain. Empirical work must specify in advance the target organization, the contexts in which it should operate, the outcomes expected to change, and the contexts excluded from the claim.

15.24.16 Actual demand cannot be operationally distinguished

The distinction between demand-responsive cognition and unnecessary continuation is central. The architecture would be weakened if no defensible operational boundary could be developed between thought serving a practical, organismic, learning, creative, or environmental requirement and thought prolonged primarily by the recursive relevance of its own products.

The narrator's report that a thought was unnecessary is not sufficient. Criteria should include relation to an unresolved condition, availability of action or new information, novel contribution of continued cognition, termination after resolution, and behavioural or biological consequences. The boundary may remain probabilistic, but it must be independently constrained. If any spontaneous thought can be classified after the fact as necessary or residual solely according to whether it fits the prediction, the account becomes circular.

15.24.17 Selective metabolic prediction fails

The framework predicts preserved metabolic recruitment during actual demand together with reduced persistence and accumulated cost after resolution or during purposeless recursive continuation. It would be weakened if claimed reorganization produced no selective difference between task-relevant activity and post-resolution extension, or if reduced metabolism occurred only because the organism had become globally less responsive or cognitively less capable. [16, 33–35, 42, 44, 118–121]

The expected pattern is:

actual demand -> full relevant recruitment -> resolution -> rapid decline of unnecessary continuation and accumulated cost.

Failure to detect this selectivity across appropriate temporal and biological measures would require revision of the Friction Signature predictions.

15.24.18 Strong falsification standard

No single failed prediction should automatically invalidate the entire architecture. Measurement limitations, inadequate sample size, biological variability, incorrect targeting, and incomplete operationalization must be considered. The framework would nevertheless be seriously weakened by a convergent pattern in which conceptual knowledge and direct perception are indistinguishable; claimed insight requires continuous control; former organizations regain unchanged authority; suffering within the constrained domain does not change; unnecessary chains remain unchanged; practical cognition deteriorates; Friction Signatures show no selective alteration; and suppression, suggestion, learning, altered state, dissociation, or impairment explains the observations more effectively.

The architecture must not survive such a pattern merely by redescribing it. Correspondingly, support would require a selective and convergent profile: conceptual knowledge is distinguishable from durable reorganization; the old organization loses authority without continuous correction; residual self-representations recruit drastically less ownership and defence; unnecessary cognition shows lower transition probability and shorter chains; residual activation terminates rapidly; practical cognition and L1 phenomenology remain intact; the relevant Friction Signature is sharply shortened or fails to develop; and the change persists across the contexts included within the claimed scope.

The falsification standard can therefore be stated directly: if insight is genuinely recursive reorganization, it must change the behaviour of the organization it claims to constrain. If the organization continues to govern unchanged, no such reorganization has been demonstrated. If thought is suppressed, effort and rebound should expose the suppression. If cognition is globally reduced, practical impairment should expose the reduction. If only knowledge has changed, contextual recurrence and corrective effort should reveal the continued viability of the prior organization. If the self-generating movement has lost authority, ownership, defence, evaluator-evaluated conflict, and self-security should be selectively reduced. If conditioned continuity has lost authority, unnecessary initiation, chain propagation, and post-resolution continuation should be selectively reduced. If choiceless awareness has been derived correctly, phenomenology and practical cognition should remain while compulsory psychological occupation is drastically attenuated. These consequences are not optional additions imposed after the theory has been stated. They are the empirical risks generated by the architecture itself.

15.25.0 Scientific Boundaries and Conclusion

The account developed in this section proposes a biologically grounded architecture of insight, but its claims must remain proportional to the evidence presently available. It distinguishes knowledge acquisition from recursive reorganization, conceptual understanding from direct perception, temporary complete attention from durable alteration of recruitment, meditation from method, insight into the self-generating movement from insight into conditioned cognitive continuity, and choiceless awareness from generalized cognitive suppression. These distinctions generate testable consequences; they do not establish that every component of the proposed mechanism has already been demonstrated. The scientific task is therefore to preserve the explanatory reach of the architecture without converting derivation into premature empirical certainty.

15.25.1 Scientific Boundaries

The framework does not claim that all thought permanently ends. Thought remains a necessary biological capacity. Memory, language, comparison, prediction, imagination, planning, problem-solving, and practical evaluation depend upon the organism's ability to activate and reorganize accumulated knowledge. The proposed transformation concerns compulsory continuation when no practical, organismic, or environmental requirement remains unresolved, not the duration of cognition as such. A demanding task may require prolonged comparison, simulation, correction, and planning; a conversation may require sustained memory, language, and social prediction. Cognition remains demand-responsive where it is recruited by an actual requirement and can terminate when that requirement has been addressed. [68, 96–99, 102, 163, 165, 203]

actual requirement -> cognition recruited -> comparison, planning, simulation, or action -> requirement addressed -> cognition terminates.

The predicted change is therefore not permanent cognitive absence. It is a transition from thought as a nearly continuous self-propagating occupation toward thought as an intermittently recruited biological instrument.

The framework also does not claim that every historically conditioned biological pathway is immediately erased. Memory, association, autonomic response, language, social conditioning, and learned patterns have been biologically embodied over time. A direct change in governing authority need not instantaneously eliminate every route through which a familiar representation, bodily response, or conditioned thought can arise. A relational cue may briefly activate an old defensive configuration, a bodily

sensation may recruit an earlier fear association, or a memory may be reconstructed. The prediction concerns what follows. Where the associated organization has been extensively constrained, residual activation should acquire little recursive gain and should be less capable of recruiting autobiographical continuation, projection, self-defence, autonomic amplification, or a prolonged Friction Signature. Retained pathway does not necessarily imply retained governing authority. [94, 96, 101, 203]

Nor does the framework require every organism to encounter identical perceptual content. The recursive audit is organism-relative. Each organism carries a distinct history of learning, language, relationship, social role, fear, desire, injury, reward, punishment, belief, skill, and biological regulation. The self-generating movement may therefore become perceptible through different conditioned organizations: fear in one case, comparison in another, and shame, attachment, control, intellectual authority, social approval, relational conflict, or psychological becoming in others. The proposed invariant is not a universal sentence or experience. It is the operation through which thought functioning in psychological time generates and sustains the virtual reference point experienced as an independent thinker, observer, evaluator, controller, owner, chooser, seeker, or sufferer. [6, 7, 96, 100, 101]

The framework does not claim that one perceptual event always produces complete, irreversible, or globally stable reorganization. The scope of perception may be limited. One fear may become nonviable while the wider organization of fear remains; one form of attachment may be constrained while comparison continues; or the self-generating movement may be perceived in one context while strongly conditioned relational configurations remain active elsewhere. The proposition that what has been fully perceived cannot regain its former authority, whereas what has not been fully perceived can still operate, remains a framework proposition and empirical prediction rather than an established universal law. Its test is not the reported intensity of an event but whether the organization proposed to have become nonviable subsequently behaves as though it has lost authority across time, context, stress, relationship, and the conditions that formerly recruited it.

Scope must not become an all-purpose explanation for failed prediction. The organization claimed to have been constrained and the expected range of consequences should be specified before testing wherever possible. If an allegedly nonviable organization repeatedly returns with the same interpretation, corrective effort, recursive continuation, autonomic amplification, and metabolic burden under comparable conditions, the account must consider incomplete reorganization, misidentified target, inaccurate report, failure of the proposed irreversibility relation, or revision of the mechanism. Residual activation cannot indefinitely protect the framework from unchanged governing authority.

No single biomarker is expected to establish insight. Default-mode-network activity, heart-rate variability, skin conductance, glucose metabolism, oxygen consumption, network connectivity, EEG dynamics, and subjective calm are each influenced by multiple biological and contextual conditions. Reduced network activity can accompany externally demanding tasks; reduced autonomic activation can accompany sedation, avoidance, fatigue, or successful regulation; and reduced thought can result from suppression, impairment, or diminished arousal. A credible candidate reorganization therefore requires convergence across an appropriate combination of phenomenological report, loss of former governing authority, behaviour under relevant challenge, thought-transition dynamics, autonomic trajectory, metabolic duration, network coordination, preserved practical cognition, and longitudinal stability. The Friction Signature is a multidimensional temporal profile, not a diagnostic biomarker. [11–13, 16, 33–36, 42, 44, 118–121, 149, 201]

One silent attentional interval likewise does not establish durable reorganization. Complete attention demonstrates that thought operating through psychological time can cease while present organism-relative phenomenology remains. The interval may be silent, may constitute meditation in the immediate structural sense developed here, and may be subjectively profound. The organization that later reinstates cognition may nevertheless remain unchanged. The decisive evidence lies after the interval: whether unnecessary thought returns with the same frequency, whether one internally generated event again recruits another, whether self-protective narration reappears unchanged, whether continuous effort is required to recover silence, and whether the interval becomes another achievement to be owned and pursued. A temporary state demonstrates biological possibility; durable insight predicts altered future recruitment.

15.25.2 Claims Advanced by the Architecture

Within these boundaries, the section advances nine specific architectural propositions.

First, thought is memory-dependent activity operating through psychological time. It is the present activation and movement of accumulated knowledge, conditioning, language, evaluation, and retained biological history. It reconstructs prior events, interprets present conditions through that retained organization, and projects possible futures. Even apparently novel thought depends upon recombination, abstraction, reinterpretation, or projection of accumulated organization, although its trajectory may remain nonlinear, variable, and difficult to predict. [5–10, 96–99, 102, 201]

Second, perception is not reducible to thought. Present organism-relative registration may be rapidly named, interpreted, compared, or reconstructed through memory, but it is not identical to those operations. This distinction is required if a present relation is to constrain an organization rather than merely become additional content within it. A system limited entirely to rearranging retained thought could modify its propositions and associations; it would not by itself explain how an operative relation becomes directly evident and renders the governing organization incoherent.

Third, direct perception can, in principle, render a recursive organization incapable of coherently governing subsequent experience in the same way. The proposed mechanism is constraint through negation:

> present event -> interpretation through an existing recursive organization -> direct perception of a relation the organization cannot coherently contain -> loss of viability -> loss of governing authority -> recursive reorganization.

The prior organization may remain representable as memory, history, conceptual understanding, or intentionally reproduced perspective. What changes is its capacity to govern sincerely and without contradiction.

Fourth, the self is generated by thought rather than standing as its independent author. Accumulated knowledge and memory become active through psychological time; recursive organism-relative evaluation indexes that activity relative to the living system; and a continuously updated virtual reference point is generated and subsequently represented as thinker, observer, evaluator, controller, owner, chooser, seeker, and sufferer. The self need not be intentionally invented. It is repeatedly authored through memory, language, comparison, ownership, fear, desire, social conditioning, expectation, and psychological becoming. The apparent author is therefore derived as a product of the recursive organization it seems to command. [5–7, 20, 69, 195–199]

Fifth, the general mechanism of insight remains constant across targets. Insight into the Santa Claus organization, a stage illusion, a fear, the self-generating movement, or conditioned cognitive continuity does not require a hierarchy of fundamentally different kinds of insight. The common sequence is direct perception, incompatibility with the governing organization, constraint through negation, and loss of governing authority. What differs is the target and the extent of the organization participating across subsequent experience. Greater consequences indicate broader scope of constraint, not a higher grade of insight.

Sixth, the extent of reorganization depends upon how much of the operative organization has been directly perceived. One fear may be constrained without the wider structure of fear; one desire without psychological becoming; one identity without the broader process of ownership; or one relational pattern while other conditioned roles remain active. The later appearance of a related movement does not automatically show that a fully constrained organization has recovered. It may reveal that the initial perception did not encompass the related organization. This qualification is legitimate only when target and scope are specified in a manner that remains empirically vulnerable.

Seventh, residual thought may arise without receiving recursive gain. A historically conditioned pathway may still produce a representation. The decisive change is whether the representation becomes a stimulus for further cognition. Before extensive reorganization, internally generated content can acquire organism-relative relevance, recruit memory, comparison, or projection, produce another representation, and continue psychological time. After extensive reorganization, an unnecessary thought may arise, its actual present relevance may be registered, no unresolved demand may be present, and no subsequent transition may be supported. The thought dissolves without an independent chooser rejecting it. Lack of continuation is the functional expression of lack of actual present demand. [94, 96, 101, 201, 203]

Eighth, practical cognition can remain fully available while unnecessary thought becomes intermittent. The organism should retain memory retrieval, language, planning, problem-solving, task performance, learned skill, social communication, and adaptive response to actual danger. The proposed change is selective: fewer unnecessary initiations, less autobiographical and anticipatory continuation outside actual demand, shorter spontaneous chains, readier termination after practical resolution, and longer intervals without psychological time. Thought remains an available biological capacity; it ceases to function as the organism's compulsory ongoing occupation. [68, 96–99, 102, 149, 203]

Ninth, choiceless awareness may arise naturally when psychological time is no longer unnecessarily reinstated. It is not produced by a self choosing not to choose. The apparent chooser is generated within thought and cannot independently stand outside the process that generates it. Continuous effort to maintain silence would recruit memory of a desired state, comparison with the present, correction, monitoring, and projection of future continuation, thereby reinstating psychological time. Choiceless awareness follows where no actual demand is present, unnecessary cognition receives no recursive gain, present organism-relative phenomenology remains, and no separate selector is required. It denotes reduced compulsory cognitive occupation, not reduced cognitive capacity.

15.25.3 Meditation Within the Completed Architecture

The completed derivation also permits a precise placement of meditation. Meditation is the silent interval in which thought operating through psychological time is absent while present organism-relative awareness remains. It is not identical to posture, ritual, mantra repetition, concentration, breath control, or a prescribed method. Such practices may alter physiology, arousal, attention, and the probability that cognition becomes quiet, and they may have important biological or practical consequences. Their performance is not identical to the silence being defined. While a mantra is repeated, memory-dependent symbolic activity continues; while concentration is effortfully maintained, selection, exclusion, and correction continue; and while progress is evaluated, the virtual reference point operates through psychological time. [36, 37, 43, 59, 149]

The distinction is therefore exact: a method may alter the conditions in which silence occurs; meditation is the silence itself. A temporary meditative interval may occur while the ordinary recruitment architecture remains viable. Choiceless awareness refers more specifically to meditative attention arising naturally because unnecessary psychological time is no longer automatically reinstated. Where prior recruitment remains, silence ends and cognition resumes. Where unnecessary recruitment has been constrained, a residual thought may arise, fail to acquire recursive gain, dissolve, and be followed naturally by silence. Meditation is not pursued as a future psychological achievement in this architecture, because pursuit would reconstruct the seeker moving through time toward a desired state. Meditation is present where that movement is absent.

15.25.4 Scientific Obligations

The architecture remains scientifically incomplete until its central terms are operationalized. Knowledge acquisition must be distinguished from recursive reorganization; conceptual agreement from loss of governing authority; temporary silence from durable alteration of recruitment; suppression from natural dissolution; practical cognition from unnecessary continuation;

reduced self-reference from dissociation; choiceless awareness from global cognitive suppression; and domain-limited reorganization from broad structural change.

Several variables require particular development. Direct perception must be distinguished experimentally from sudden inference, reinterpretation, expectancy, and strongly encoded conceptual learning. Governing authority must be expressed through recurrence, behaviour, context dependence, corrective effort, transition trajectory, and organism-level biological response. Actual demand must be distinguished from cognitive activity serving an adaptive function unavailable to introspective report. Recursive gain must be translated into measurable transition probabilities, chain duration, salience, autobiographical recruitment, network persistence, autonomic amplification, or metabolic extension. Scope must be specified without allowing every contradictory result to be reassigned to an unperceived domain, and stability must be assessed longitudinally under conditions likely to recruit the previous organization.

These are not peripheral refinements. They determine whether the architecture becomes a scientifically testable account rather than remaining a coherent phenomenological description. The theory must remain open to partial revision. The distinction between thought and perception may require greater biological resolution; the relation between automatic recursive relevance and cognitive continuation may prove incomplete; some spontaneous cognition may serve functions not presently recognized; the transition from direct perception to altered recruitment may involve mechanisms not yet represented; Friction Signatures may require condition-specific weighting; and the distinction between ordinary learning and insight may prove more continuous than presently formulated. Such possibilities identify where empirical evidence must constrain the architecture.

The falsification conditions established in the preceding subsection remain decisive. The architecture would be weakened if conceptual instruction reliably produced the same durable transformation as the proposed direct perception; if practical cognition consistently deteriorated; if the former organization repeatedly regained unchanged authority; if psychological suffering remained unchanged despite credible constraint of its proposed generating organization; if unnecessary initiation and thought-transition probabilities remained unchanged after credible insight into conditioned continuity; if residual thought continued to produce the same prolonged chains and biological burden; if predicted Friction Signature differences repeatedly failed under appropriate measurement; or if the model could not distinguish reorganization from suppression, suggestion, catharsis, belief, ordinary learning, dissociation, or global impairment.

15.25.5 Final Derivational Sequence

The complete argument can be represented as one continuous architecture organized into three connected movements.

The first derives the virtual self and psychological suffering:

> accumulated knowledge and memory -> thought operating through psychological time -> reconstruction of the past and projection of the future -> recursive organism-relative evaluation -> continuously updated virtual reference point -> attribution of thought, evaluation, action, and experience to that reference point -> apparent self as thinker, observer, evaluator, controller, owner, chooser, seeker, and sufferer -> false division between evaluator and evaluated -> ownership of psychological injury -> comparison, condemnation, resistance, defence, self-security, and projected completion -> sustained psychological suffering through continued psychological time.

The second movement applies direct perception to the self-generating organization:

> direct perception of the self-generating movement -> causal reversal becomes evident -> the self is perceived as product rather than author of thought -> the independent self-organization is constrained through negation -> ownership, self-defence, evaluator-evaluated conflict, and psychological becoming lose governing authority -> L1 phenomenology and practical cognition remain preserved.

The third movement addresses the continued operation of cognition after the self has lost independent authority:

recognition that thought biologically precedes the virtual self -> question of why cognition continues without actual demand -> direct perception of conditioned cognitive continuity -> internally generated content perceived becoming a stimulus for further cognition -> automatic recursive relevance exposed as conditioned rather than intrinsically necessary -> former recruitment organization constrained -> automatic recursive gain reduced -> unnecessary thought arises less frequently or arises without recruiting another thought -> autobiographical and anticipatory continuation diminish -> autonomic and metabolic amplification shorten -> cognition remains recruitable by actual demand -> requirement addressed -> cognition terminates -> psychological time becomes intermittent -> intervals of silence -> meditation -> attention without continuous corrective effort -> naturally occurring choiceless awareness.

This sequence does not require a second subject to appear after the virtual self has been constrained. No hidden witness is inserted and no permanent observer is placed beneath thought. Present organism-relative phenomenology remains the inside view of the living biological process; the narrator no longer needs to claim ownership of that presence. The final structure is not that one self disappears and a purer self remains as awareness. It is that the thought-generated self loses independent authority, no replacement owner is required, and organism-relative phenomenology remains. The observer is not replaced; the demand for an observer has been removed.

15.25.6 Conclusion

The account developed here proposes that insight is not fundamentally the accumulation of another item of knowledge. It is recursive reorganization occurring when direct perception renders a previously governing organization incapable of coherently continuing in the same way. The mechanism remains constant across targets. A bounded interpretation may lose authority within

one domain; the self-generating movement may lose authority across ownership, evaluation, comparison, fear, desire, self-security, and psychological becoming; and conditioned cognitive continuity may lose authority where internally generated content had previously recruited unnecessary thought.

The proposed transformation does not require cognitive destruction. Primary phenomenology, memory, language, practical thought, planning, problem-solving, social response, learned skill, and biological protection remain. What changes is the authority and continuation of recursive organization. The virtual self is no longer required as an independent thinker behind thought; the evaluator is no longer divided from the evaluated movement; and the observer is no longer imagined outside what is observed psychologically. An unnecessary thought need not be opposed, controlled, or suppressed. It may simply fail to acquire recursive gain. When actual demand exists, cognition operates. When the requirement ends, cognition can terminate. When thought is absent, present organism-relative awareness remains; the interval is silent, and that silence is meditation. When unnecessary psychological time is no longer automatically reinstated, attention arises naturally without an independently existing chooser. Within the present architecture, that condition is choiceless awareness. [68, 96–99, 102, 203]

In compressed form: thought is accumulated knowledge and memory operating through psychological time. Complete attention is present perception without that movement, and the interval is silent. Insight renders a governing recursive organization nonviable. When the self-generating movement is perceived, the self is revealed as a product rather than the author of thought. When conditioned cognitive continuity is perceived, unnecessary thought loses recursive gain and dissolves while practical cognition remains available. Choiceless awareness is the attention that arises naturally when psychological time is no longer unnecessarily reinstated.

16.0 The Philosophical Zombie and the Structural Incoherence of a Dark System

The philosophical zombie thought experiment proposes an organism that is physically and functionally identical to a conscious human being while lacking phenomenology entirely. Such a system would behave normally, discriminate stimuli, learn, remember, deliberate, report pain and pleasure, respond to threat, plan future action, and describe an apparently private mental life, while there would nevertheless be nothing it is like to be that organism. [26, 210]

Within the framework developed here, this strict philosophical zombie is structurally inconceivable. The difficulty is not merely that such a system appears biologically improbable. The zombie stipulation requires two conditions to be simultaneously true: the complete relevant biological and causal organization of the conscious organism must remain unchanged, while the organism-relative inside view of that organization is absent. The present framework does not treat those as two independently adjustable properties. Phenomenology is not introduced as an additional output attached to an otherwise complete biological event. It is the organism-relative inside aspect of the relevant bounded biological organization itself.

The argument therefore does not begin by asking why a physically complete organism should additionally possess consciousness. It asks whether the biological organization being stipulated would remain the same organization after its organism-relative aspect had been removed.

16.1 The Strict Zombie Must Preserve More Than Behaviour

A distinction is required between behavioural imitation and the strict philosophical zombie.

A machine could produce the sentences “I see red,” “that hurts,” “I am afraid,” or “I remember yesterday” without instantiating the biological organization that produces those reports in a living human being. Behavioural similarity alone therefore does not establish biological, causal, or dynamical identity. A behavioural simulator may reproduce selected outputs through an entirely different internal organization. Such a system might be an impressive imitation, but it would not satisfy the philosophical-zombie stipulation in its strongest form.

The strict zombie must preserve the complete organization responsible for the behaviour. It must preserve sensory registration, bodily regulation, organism-relative salience, memory access, evaluation, prediction, action selection, biological state transitions, cognitive recruitment, learning, practical reasoning, self-reference, and the recurrent organization through which present cognitive products alter subsequent processing.

This requirement becomes decisive because the present framework does not describe human cognition as neutral information processing followed by an optional subjective accompaniment. Present conditions are registered relative to the organism's current state, retained biological and psychological history, capacities, vulnerabilities, available actions, and regulatory requirements. Perception itself is defined here as present organism-relative biological integration rather than detached recording.

A genuine duplicate must therefore reproduce not merely what the organism does, but the organism-relative organization through which what it does becomes biologically possible.

16.2 The Organism-Relative Identity Constraint

The central constraint can be stated without introducing an additional metaphysical substance.

Consider the complete organism-relative biological event and its organism-relative inside view.

The framework proposes that these are not two separate events connected by an unexplained production relation. The externally accessible biological organization and the organism-relative inside view are two aspects of the same relevant event under different conditions of access.

The zombie requires:

complete organism-relative biological event preserved
→ organism-relative inside view absent

The framework instead entails:

complete organism-relative biological event preserved
→ organism-relative inside aspect preserved

If the organism-relative inside aspect is removed, then the relevant event has been changed. If the event has genuinely remained identical, then the organism-relative aspect has not been removed.

The contradiction is therefore not that a zombie behaves strangely. By stipulation it does not. The contradiction arises because the thought experiment preserves the complete event while simultaneously removing what the framework identifies as a constitutive aspect of that event. If the inside view is absent, the stipulated biological event is no longer identical; if the biological event is genuinely identical, the inside view cannot simultaneously be absent.

This conclusion depends upon the organism-relative identity proposition developed throughout the framework. It should therefore be understood as an internal consequence of that architecture rather than as an independent premise introduced solely to defeat the zombie.

16.3 Why a Dark Organism Cannot Preserve Biological Significance

The contradiction becomes clearer when organism-relative evaluation is considered.

A living organism has no neutral biological standpoint. A condition can matter because of its relation to that organism: tissue damage, temperature, available energy, bodily instability, danger, nourishment, loss, opportunity, remembered injury, expected reward, or an unresolved practical requirement. These conditions are not evaluated from nowhere. Their significance arises within a bounded living system whose current state and retained history constrain what becomes relevant. [23, 24, 131]

A strict zombie must preserve this organization exactly.

It must therefore preserve biological significance while nothing is biologically significant for the organism.

It must preserve threat evaluation while denying organism-relative threat.

It must preserve valence while denying organism-relative valuation.

It must preserve selection according to relevance while denying the organism-relative relation through which anything becomes relevant.

It must preserve memory recruitment according to present significance while removing the inside aspect of the organism for which that significance obtains.

This is not merely a problem of language. The resulting evaluation changes biological state, alters attention, biases memory access, recruits action, changes future processing, and can initiate cognition. Pain illustrates the general structure particularly clearly. Tissue disruption or another harmful condition is not processed as a neutral datum followed by an optional feeling. The event reorganizes attention, autonomic state, avoidance, prediction, memory, and action relative to the organism undergoing it. [23, 27, 28, 56, 114]

If all of those organism-relative relations are preserved exactly, the framework provides no additional phenomenal object that can subsequently be removed.

Conversely, if the system is converted into genuinely neutral processing in order to make it “dark,” an indispensable organizational relation has been removed. The dark system is then no longer the stipulated biological duplicate.

16.4 The Operational Architecture of Thought Makes the Contradiction Explicit

The operational architecture of thought strengthens this constraint because the zombie must reproduce not only outward behaviour but the causal organization through which cognition arises.

The framework does not begin with an independent thinker deciding what thought to produce. A bounded organism encounters present internal or external conditions through an organization shaped by biological history, memory, learning, conditioning, and present state. Differential organism-relative evaluation alters biological organization and selectively recruits memory-dependent representational operations. The resulting thought can itself become a new present internal condition and undergo renewed evaluation. [68, 96–99, 108, 201]

In compressed form:

present internal or external condition
→ organism-relative evaluation
→ biological state transition
→ selective cognitive recruitment

→ memory-dependent representation or thought
→ representation becomes a new present internal condition
→ renewed organism-relative evaluation
→ further cognition, action, or resolution

The apparent thinker emerges later within this movement. Through psychological time and recursive attribution, a historically maintained virtual reference point is represented as the thinker, evaluator, controller, owner, and author of cognition. The causal sequence is therefore reversed in ordinary experience: the product of thought is retrospectively interpreted as its source. [5–7, 20, 69, 195–199]

The strict zombie must reproduce this entire organization.

It must reproduce why one condition becomes relevant while another does not; why a biological transition occurs; why memory rather than another operation is recruited; why a particular representation arises; why that representation becomes a new internal stimulus; why further cognition follows; and why the resulting cognitive activity is attributed to an apparent psychological author.

The decisive question is therefore:

Where within this organism-relative causal sequence can phenomenology be removed while the complete organism-relative organization remains genuinely unchanged?

Within the proposed framework, there is no such point.

Removing an additional spectator would make no difference because the framework contains no additional spectator. Removing the virtual thinker would not remove phenomenology because the thinker is downstream. Removing organism-relative registration, valuation, or integration would alter the causal organization that determines what becomes significant and what cognition is recruited.

The zombie therefore cannot be obtained by subtracting one final phenomenal ingredient from an otherwise complete mechanism. No such detachable ingredient exists within the architecture.

16.5 Insight Provides a Control Condition

The preceding Insight architecture supplies an important internal control against a common source of zombie intuition.

Ordinary experience encourages the assumption that phenomenology belongs to an internal observer: there is an apparent "me" who sees, feels, thinks, chooses, and experiences. If that apparent experiencer is mistaken for the source of phenomenology, it becomes tempting to imagine removing it and leaving behind a fully functioning but experientially dark mechanism.

The present framework separates these operations.

L1 primary organism-relative phenomenology is distinguished from downstream narrator-mediated recognition, ownership, autobiographical reconstruction, and report. Complete attention demonstrates within the architecture that thought operating through psychological time can be absent while organism-relative awareness remains. No separate observer is required to own the interval. [30, 31, 54, 75, 191–194]

The Insight derivation extends this distinction. The virtual reference point can lose governing authority as an independently existing thinker, observer, evaluator, controller, owner, and sufferer while L1 phenomenology and practical cognition remain preserved. The completed derivation requires no hidden witness or replacement self: organism-relative phenomenology remains while the narrator no longer needs to claim ownership of it.

The resulting control relation is:

no self ≠ no phenomenology
no narrator ≠ dark system
no psychological owner ≠ zombie

This matters because Insight demonstrates architecturally that removing the apparent experiencer is not the same operation as removing experience.

The zombie therefore cannot be generated simply by deleting the psychological self, narrator, owner, or reporter. Those are downstream organizations whose attenuation can coexist with preserved organism-relative phenomenology. Indeed, the framework predicts precisely this selective relation: unnecessary narrator-mediated cognition may diminish while sensory integration, affective tone, bodily registration, practical responsiveness, memory, language, and L1 phenomenology remain.

The zombie requires something much stronger. It requires the organism-relative inside view itself to disappear while the complete biological organization responsible for organism-relative functioning remains identical.

That is the operation the framework does not permit.

16.6 What Remains Conceivable

Several conditions may superficially resemble philosophical zombies without satisfying the strict definition.

A system may imitate reports of consciousness without sharing the underlying biological organization. A person may retain phenomenology while losing the ability to report it. Narrative selfhood may be reduced while sensory and affective presence remain. Ownership may become disrupted through dissociation. Anesthesia may preserve local biological processing while

altering the larger organization required for waking phenomenology, memory, behavioural responsiveness, and report. An artificial automaton may reproduce a restricted set of human behaviours through a different causal architecture. [30, 31, 38–40, 46, 47, 54, 60, 73–75, 182, 185, 186]

Real-world "dark" conditions sharpen this distinction rather than weaken it. Coma and sufficiently deep suppressive anesthesia can severely disrupt ordinary waking phenomenology, access, responsiveness, memory, and report, but they do so together with alteration or suppression of the biological organization supporting those capacities. They therefore instantiate the opposite relation from the strict philosophical zombie. The biological system is not preserved in its complete waking organization while phenomenology alone disappears; the relevant organization itself has changed. Such conditions consequently provide no empirical analogue of a biologically identical but phenomenally absent organism. Instead, they illustrate that where ordinary conscious organization is profoundly disrupted, the biological organization is disrupted with it. [38–40, 53–55, 73–75, 170, 172, 173, 182, 185]

None is a strict philosophical zombie.

The distinction is crucial because failure of report is not absence of phenomenology; loss of the virtual self is not absence of phenomenology; diminished cognition is not identical biological organization; and behavioural imitation is not physical and causal duplication. [30, 31, 54, 75, 182, 186]

The strict philosophical zombie receives no such escape. It must remain biologically, causally, dynamically, and functionally identical while phenomenology alone is absent.

It is precisely that conjunction that becomes incoherent within the present framework.

16.7 Structural Inconsistency of the Dark Duplicate

The complete argument can now be stated compactly.

The framework proposes a bounded living organism whose present conditions are integrated and differentiated relative to its own state, biological history, vulnerabilities, capacities, and available responses. Organism-relative evaluation alters biological state and determines cognitive recruitment. Memory-dependent cognition can become new present input, generating further evaluation and further thought. Psychological time recursively maintains a virtual reference point to which this activity is subsequently attributed. None of these operations requires an additional inner witness.

The organism-relative inside view is not placed beside this organization as an optional property. It is the inside aspect of the relevant organism-relative biological event.

The strict philosophical zombie nevertheless requires:

the complete organism-relative biological organization is identical
+
the organism-relative inside view is absent

But if the inside aspect is constitutive of the relevant organism-relative event, removing it changes the event.

Therefore:

inside aspect removed
→ complete relevant event no longer identical

while:

complete relevant event genuinely identical
→ organism-relative inside aspect remains

The zombie stipulation consequently attempts to preserve the process while removing an aspect that the framework identifies as constitutive of the process.

This is why the dark system is not merely biologically unlikely. Within the architecture, it is structurally incoherent.

16.8 Scope of the Claim

The conclusion should be stated strongly but within its proper boundary.

The present argument does not purport to prove that philosophical zombies are metaphysically impossible under every conceivable ontology. Nor does it claim that behavioural simulation of consciousness is impossible, that every form of information processing is phenomenal, or that the presence or absence of phenomenology can presently be inferred from one biological measurement.

The claim is narrower and more precise.

Under the organism-relative identity proposition developed in this framework, the strict philosophical zombie is internally inconsistent.

The zombie is defined as a complete physical, biological, causal, dynamical, and functional duplicate from which phenomenology alone has been removed. But the architecture developed here does not contain phenomenology as an optional final addition to such an organization. It identifies the organism-relative inside view as an aspect of the relevant bounded biological event itself. [210]

The zombie therefore assumes in advance the separability that the framework denies and then asks what happens when that separability is imposed.

Once the organism-relative architecture is made explicit, the stipulated subtraction cannot be performed while identity is preserved.

Within the proposed framework, a philosophical zombie is structurally inconceivable.

17.0 The Mapping Theorem: A Falsifiable Biological Architecture for Testing Phenomenology–Biology Identity

17.1 Statement of the Mapping Theorem

The present section formulates the framework's Mapping Theorem: a proposed and falsifiable identity relation between primary phenomenology and the complete bounded organism-relative biological event specified earlier in this manuscript. The term *Mapping Theorem* names the framework's constrained theoretical proposition; it does not imply that the proposed identity has already been mathematically proved or prospectively validated.

The two sides of the proposed relation must be specified independently. **Primary phenomenology** refers to the immediate phenomenal character of an event—the organism-relative inside view—prior to its explicit recognition, autobiographical ownership, conceptual interpretation, or report. The term *organism-relative* identifies the perspective from which the event occurs without introducing an additional observer standing apart from that event.

The proposed biological counterpart is the **complete bounded organism-relative biological event**. This is not an isolated neural discharge, metabolic increase, autonomic response, energetic expenditure, or other single measurement. It is the causally coherent biological state-transition within which relevant change is selectively registered, retained or allowed to persist sufficiently to affect subsequent processing, integrated with the organism's present condition and history, differentially organized relative to the organism, transformed through coordinated biological activity, and resolved or incorporated into a resulting state.

The strong Mapping hypothesis is that these are not two independently occurring events connected by a later conversion. Within the living-system domain defined below, the framework proposes that primary phenomenology is the organism-relative phenomenal aspect of the same complete biological occurrence that can be investigated through third-person biological measurement. The identity claim is therefore event-level rather than biomarker-level. It does not propose that metabolism becomes experience, that neural activity produces a second phenomenal substance, or that a measurement variable is itself phenomenology.

Friction Signatures provide the empirical interface to the biological side of this proposition. A Friction Signature is an operational, multidimensional measurement representation constructed from selected observable features of the changing biological organization. It can therefore constrain a candidate biological event without being identical to the event it measures. The controlling distinction is:

$$\begin{gathered}\text{complete bounded biological event} \\ \neq \\ \text{Friction Signature measurement representation} \\ \neq \\ \text{primary phenomenology}\end{gathered}$$

The proposed identity concerns the complete biological event and primary phenomenology. Whether particular Friction Signature measurements adequately capture the biological dimensions required to test that identity is a separate empirical question.

The Stochastic Pump occupies another distinct level. As defined in Section 6, it is the framework's proposed systems-level support architecture organizing established distributed biological work required to maintain, recruit, contain, perturb, and restore the physical conditions upon which bounded organism-relative events depend. It is not the bounded event itself, is not a Friction Signature, and is not proposed as a separate mechanism that generates phenomenology. Its relevance to the Mapping Theorem is that the candidate event occurs only through materially implemented biological processes whose support conditions and measurable consequences can in principle be experimentally constrained.

The Mapping Theorem also inherits the manuscript's preceding correction of the explanatory target. The present framework argues that formulations which begin with experience *for* an already existing subject risk assigning the downstream narrator to a primitive explanatory position. The theorem does not need to reproduce that Category Error argument. It inherits its result: narrator-level recognition, ownership, autobiographical interpretation, and report must not be substituted for primary phenomenology.

Three levels must therefore remain distinct throughout the Mapping analysis: the complete organism-relative biological event; primary phenomenology; and the recursive narrator or self-model through which some events later become explicitly recognized,

attributed, remembered, and reported. The narrator is a materially implemented biological and representational organization, but the virtual reference point represented as "I" is not treated as an additional observer to whom phenomenology must be delivered.

The distinction is architectural rather than dependent upon a large temporal interval. Primary phenomenology need not be completed before recursive processing begins, and primary and recursive processes may rapidly overlap and interact. *Primary* means that the occurrence of phenomenology is not generated by the later act of recognizing, labeling, or owning it. Once recursive processing is active, its consequences can alter the organism and thereby modify subsequent phenomenological events without retroactively making narrator-level ownership the source of the event from which that recursive processing arose.

The Venus flytrap provides a useful biological boundary illustration for this narrow point. Trigger-hair stimulation can initiate action potentials and propagating cytosolic Ca^{2+} signals; temporally related stimulation can raise cytosolic Ca^{2+} beyond the level associated with rapid trap closure, while ion channels, transporters, and proton pumps participate in electrical signalling and recovery. [66, 77, 78] This sequence can be mechanistically described without invoking autobiographical ownership, a self-image, or a narrator. Nothing in that observation establishes plant phenomenology. It demonstrates only that temporally integrated, state-dependent, thresholded biological organization does not require narrator-level representation.

The Mapping Theorem therefore begins from a stronger and more vulnerable proposition than a generic correlation between physiology and experience. It proposes that, within its defined biological domain, primary phenomenology and the complete bounded organism-relative biological event are two descriptions or aspects of one occurrence. The scientific burden is then to constrain that proposed identity without defining it into existence: independently characterize the phenomenological target, independently characterize the biological event, establish measurable predictions, perturb the relevant organization, test dissociations and boundary conditions, and determine whether increasingly constrained biological models correspond prospectively to independently characterized phenomenal states.

Strict identity is therefore the target proposition of the theorem, not an empirical conclusion assumed at its beginning.

17.2 Domain Restriction

The primary domain of the Mapping Theorem is **primary phenomenology**: the immediate phenomenal character of an event, described in this framework as the organism-relative inside view. This phenomenological domain is specified independently of the biological event proposed to correspond to it. The theorem does not define phenomenology as metabolic activity, thermodynamic work, neural integration, biological registration, or any other physical process and then recover the proposed identity from that definition.

The phrase *organism-relative inside view* likewise does not introduce an internal spectator. It indicates that phenomenology occurs from the perspective constituted by a particular organism rather than from a view from nowhere. The organism has a particular body, sensory organization, physiological state, biological history, and set of possible interactions with its environment. None of those facts requires a second entity located within the organism and observing its activity.

The primary mapping must therefore be distinguished from narrator-level access. Explicit recognition, linguistic labeling, autobiographical attribution, memory-based comparison, introspection, ownership, and report are genuine biological and cognitive processes, but they are not built into the definition of primary phenomenology. A colour can possess phenomenal character without first being represented as "the colour I am seeing," and an affective or bodily event need not first be represented as "my state" in order to occur phenomenally.

This restriction does not imply that recursive thought is phenomenally irrelevant or biologically inert. Memory-dependent representational operations can reconstruct prior events, anticipate possible events, compare present conditions with retained history, and organize content around an established self-reference. Such cognitive content can function as a new present internal stimulus. Worry, rumination, anticipation, remembered threat, self-referential judgment, and similar forms of perseverative cognition can alter cardiovascular, autonomic, endocrine, attentional, and other aspects of the organism's current state. [9, 10, 12, 13, 21, 114–116]

Within the present framework, these changes can in turn become conditions for subsequent bounded organism-relative events. Recursive processing may therefore alter later phenomenology and change the measurable biological profiles associated with later events. That causal recurrence does not make the virtual narrator an independent agent. The biological and cognitive processes are causally effective; the apparent owner represented through them is not an additional causal entity standing outside those processes.

The domain restriction must also be applied carefully to L2. The theorem does not claim that events involving recursive cognition somehow fall outside phenomenology. A remembered image, anticipated failure, self-referential thought, or recursively sustained fear may itself participate in a present phenomenal event. What is excluded from the primary mapping target is the *additional attribution* through which the event is represented as occurring to, belonging to, or being controlled by an independently existing narrator.

The resulting mapping problem is therefore not how biology produces phenomenology for a separate owner, and it is not how a Friction Signature becomes experience. It is whether primary phenomenology lawfully corresponds, at the strongest level potentially by identity, to an independently specified class of complete bounded organism-relative biological events. Friction Signatures provide empirical access to selected dimensions of those events; narrator-level recognition and report provide additional downstream evidence about them. Neither is permitted to substitute for the phenomenological target itself.

17.3 Biological Scope and Candidate Conditions

The present Mapping Theorem is deliberately restricted to **living systems**. This is a scope condition of the current framework, not a demonstrated universal proof that phenomenology is impossible in every nonliving or artificial system. The theorem asks whether a biologically specified class of living organism-relative events can be mapped to primary phenomenology with progressively increasing empirical constraint. Claims about systems outside that domain require a separate argument and are not decided by the present theorem.

Within this domain, the biological side of the mapping must be specified without assuming phenomenology. The relevant unit is therefore not "a biological event that is experienced," because that would build the conclusion into the candidate definition. It is a biologically identifiable class of bounded state-transitions whose organization can be characterized independently through causal structure, temporal development, organism-relative regulation, physical implementation, and measurable consequences.

Living systems provide a distinctive physical setting for such events because they maintain nonequilibrium organization through continual biological work. Electrochemical gradients, membrane conditions, metabolic resources, signaling capacity, tissue readiness, and wider regulatory variables require ongoing maintenance and restoration. In nervous systems, neural activity additionally depends upon ionic, synaptic, metabolic, glial, vascular, and organism-level regulatory support. [32–35, 42, 90, 91, 111] These established biological facts provide the material conditions within which the candidate event is implemented; they do not by themselves establish phenomenology or the Mapping identity.

A central framework construct within this biological description is **organism-relative valuation**. Valuation is not used here to mean reflective judgment, conscious preference, or narrator-level appraisal. It refers to differential biological organization relative to the current state and continuing regulation of the organism. The biological consequences of a condition can depend upon physiological need, prior history, available resources, vulnerability, learned significance, and present regulatory state. The same environmental input can therefore participate in different organismic transitions depending upon the biological system upon which it acts. [22–24, 101]

Organism-relative valuation must likewise not be reduced to simple survival benefit. Numerous processes contribute to continued viability without constituting the kind of bounded event targeted by the theorem. The relevant question is whether a perturbation becomes integrated into a causally coherent organism-relative transition, altering the biological organization from which subsequent regulation, action, or processing proceeds.

The present framework therefore treats the following as **candidate biological constraints**, not as already demonstrated universal necessary and sufficient conditions for phenomenology:

1. **Living bounded organization.** The relevant system maintains a physically bounded, nonequilibrium biological condition whose state can be perturbed and restored or reorganized.
2. **A causally coherent event-level transition.** The candidate unit must be distinguishable from background metabolism and from isolated local reactions. Relevant change must participate in an organized transition with identifiable causal and temporal boundaries.
3. **Organism-relative differentiation.** The developing event must be organized in relation to the organism's current condition, retained biological history, regulatory requirements, and available responses rather than being specified solely by the external stimulus.
4. **Temporally organized integration and transformation.** Consequences of the disturbance must persist or propagate sufficiently to influence the developing event and participate in coordinated reorganization. Threshold crossing is one empirically important form of this organization, but the theorem does not assume that every candidate phenomenal event must employ one universal threshold mechanism. [41, 66, 77]
5. **Resolution or incorporation.** The event must reach a biologically meaningful resulting organization—through stabilization, transformation, containment, adaptive reconfiguration, or restoration of sufficient functional availability—rather than being defined by an arbitrarily selected instantaneous measurement.

These candidate constraints describe the event class the Mapping programme is attempting to test. Future empirical work may remove, divide, refine, or add conditions if prospective evidence requires it. Their scientific value depends upon their ability to constrain the biological target rather than merely redescribe every living process as a candidate phenomenal event.

Thermodynamic embodiment provides an additional physical constraint but not a consciousness criterion by itself. Biological signaling, gradient maintenance, active transport, recurrent activity, restoration, and regulation require energetic work. [32–35, 42, 90–92] Metabolic measurements can therefore provide information about particular aspects of an event. Thermodynamic entropy production is a related but distinct quantity and generally requires explicit system boundaries, temporal assumptions, and modelling. [121] Metabolic expenditure, BOLD signal, blood flow, ATP turnover, heat production, autonomic activity, and entropy production must not be treated as interchangeable measurements. [35, 42, 44, 112, 118, 120, 121]

The Stochastic Pump organizes this physical-support problem at the systems level. The construct refers to the proposed coordination of established biological processes that maintain readiness, permit event-specific recruitment and controlled perturbation, contain disruption, and restore or reorganize the conditions required for further events. The Pump is therefore broader than an individual bounded event and narrower than metabolism as a whole. Pump activity considered independently of the complete event is not proposed to be sufficient for phenomenology.

Friction Signatures enter only after this biological architecture has been specified. They provide convergent third-person measurement access to selected biological dimensions of the candidate event and its supporting organization. Their role is

empirical constraint. They do not transform thermodynamic work into phenomenology and do not replace the complete biological event with a measurement score.

The biological domain is therefore intentionally demanding. A system does not enter the Mapping domain merely by transforming symbols, calculating outputs, consuming energy, integrating signals, or exhibiting a threshold response. The candidate event is a specific organized living transition whose boundaries, internal dependencies, perturbational behaviour, and organism-relative consequences must be identifiable independently before the phenomenal identity proposition is tested against it.

17.4 The Narrator as a Downstream Virtual Reference Point

The Mapping Theorem requires the narrator to remain distinct from the phenomenological target. The narrator is not treated as an independently existing subject that possesses experience. Within the framework, it is the virtual reference point generated when memory-dependent representational activity recursively organizes events in relation to an established organism-relative self-reference.

The term *virtual* refers to the status of the represented centre, not to the biological unreality of the processes that generate it. Memory retrieval, comparison, prediction, language, self-reference, attention, evaluation, action selection, and report are materially implemented and causally consequential. [9, 10, 68, 69, 102, 114–116, 195] What the framework rejects is the additional inference that these distributed processes require a separate owner standing behind them.

The organization can be described without assuming a rigid serial pipeline. A primary organism-relative event can become available to memory, recognition, comparison, prediction, and conceptual representation. As retained and anticipated content is organized through recurring self-reference, thought can represent events in relation to "me": what happened to me, what may happen to me, what I want, what I fear, what I should become, or what I must avoid. These operations can overlap with ongoing perceptual, affective, interoceptive, and regulatory activity rather than waiting for one fully completed event to terminate.

Within the framework, the recurring self-reference generated through this organization becomes the apparent centre from which thought, perception, intention, fear, desire, and action seem to originate. The resulting reversal can be described as **authorship reversal**: organismic and cognitive processes generate the representation of "me," while the completed representation presents "me" as though it had been the antecedent owner or author of those processes.

This is a theoretical interpretation of the architecture rather than an independently established neuroscientific entity. Its relevance to the Mapping Theorem is nevertheless precise. If narrator-level ownership is a downstream product of recursive processing, it cannot be inserted into the primary mapping as the primitive subject to whom the earlier phenomenal event must first have been presented.

Downstreamness here refers primarily to **architectural dependency**, not to a universal fixed latency. Explicit ownership, recognition, attribution, and report require content upon which those operations can act, but the biological processes supporting them may begin rapidly and may overlap with the continuing event. [30, 62, 136, 137, 191–194] Primary phenomenology therefore need not be temporally completed before every recursive operation begins. The stronger claim is that phenomenology is not generated by the act of representing the event as "mine."

Recursive activity can subsequently alter the organism. A remembered or anticipated condition can change attention, autonomic regulation, endocrine activity, memory retrieval, behavioural readiness, and other biological variables. [9, 10, 12, 13, 21, 114–116] The resulting organismic state can then influence the next perceptual, affective, or cognitive event. The architecture is therefore recurrent:

$$\begin{gathered}\text{organism-relative event}\\ \rightarrow\\ \text{recursive representation and attribution}\\ \rightarrow\\ \text{altered present biological condition}\\ \rightarrow\\ \text{subsequent organism-relative event}\end{gathered}$$

This recurrence does not restore the narrator to the antecedent position. A later biological state can affect what happens next without becoming the earlier cause or owner of the event required for that state to arise.

The distinction is particularly important for rumination and other forms of perseverative cognition. Recursive thought can repeatedly reconstruct past content or project possible future content, and those representations can function as present biological stimuli. Their physiological consequences are real even where the represented event is absent. [12, 13, 21, 114, 115, 117, 119] Within the Mapping framework, such recurrence is predicted to alter the biological trajectory and therefore potentially the Friction Signature representation of subsequent events. The exact Friction Signature consequences, however, remain empirical predictions to be tested rather than consequences assumed from the narrator construct itself.

The Mapping Theorem therefore does not eliminate recursive cognition from the biological account. It relocates it. The narrator becomes one consequential organization within the same living system whose activity it later represents as belonging to an

independent "I." Primary phenomenology remains the mapping target; narrator-level ownership, recognition, interpretation, and report remain downstream explanatory targets.

17.5 Independent Definition and Test of a Distinct Phenomenological State

For the Mapping Theorem to function as an empirical scientific proposal, phenomenological states must be distinguishable independently of the biological measurements used to test the Mapping hypothesis. The previous formulation cannot define a phenomenological state by the Friction Signature trajectory that supposedly demonstrates its biological correspondence. Such a procedure would make successful separation partly circular. [211]

A **distinct primary phenomenological state** is therefore defined at the phenomenal level: two states are distinct when they differ in one or more prespecified dimensions of phenomenal character, such as perceptual content, qualitative character, intensity, valence, bodily character, spatial organization, or temporal organization. The biological basis of that difference is not included in this definition. Identifying the biological organization that corresponds to the difference is the empirical task of the Mapping programme.

This requirement creates an unavoidable epistemic problem. Primary phenomenology is not directly available to an external investigator. Experimental work must therefore use observable evidence to classify or contrast candidate phenomenal states. Depending upon the paradigm, such evidence may include contemporaneous or retrospective report, psychophysical discrimination, controlled perceptual alternation, task performance, clinically justified behavioural evidence, or carefully validated no-report procedures. Each method has limitations, and none should be treated as transparent access to phenomenology. [30, 31, 62, 64, 191–194, 208]

Report occupies a particularly important but limited role. A verbal or behavioural report is not identical to the primary phenomenal event because reporting requires additional access, memory, selection, and output processes. [30, 62, 191–194, 208] Nevertheless, when report is used as part of a prespecified state criterion, discrepant reports cannot simply be discarded whenever they conflict with the biological model. Their evidential status must be specified in advance. Likewise, any behavioural, physiological, neural, or other measure used to define the target state cannot simultaneously be treated as independent evidence from the biological predictor without an explicit separation of roles. [211]

The Mapping analysis therefore requires a methodological distinction in addition to its three ontological levels. Ontologically, the framework distinguishes primary phenomenology, the complete biological event, and narrator-level access or ownership. Methodologically, it must also specify an **independent state-identification criterion** through which experimental states are classified before the biological Mapping model is tested.

The required order is:

$$\begin{gathered}\text{independent state criterion}\\ \rightarrow\\ \text{state classification}\\ \rightarrow\\ \text{biological prediction and test}\end{gathered}$$

The biological predictor is constructed from measurements of the candidate event. Friction Signatures provide the framework for organizing these measurements into a multidimensional empirical representation. The biological model may be developed or calibrated against state classifications in development data, but the feature definitions, transformations, model architecture, decision rules, comparison conditions, and success or failure criteria must then be frozen before confirmatory testing on independent data. [211]

This distinction prevents the theorem from hiding its conclusion inside either side of the comparison. The phenomenological criterion cannot contain the Friction Signature variables whose predictive success is being tested. Conversely, the biological predictor cannot be declared successful merely because it reproduces labels that were themselves partly defined by the same biological measurements. [211]

The proposed identity relation makes a substantive prediction. If two states are genuinely phenomenologically distinct, then under the identity hypothesis the complete organism-relative biological events corresponding to those states cannot be identical in every identity-relevant respect. The empirical problem is whether a prespecified measurement architecture can detect and correctly characterize the relevant biological difference.

That prediction must not be converted into an unlimited measurement escape clause. Failure of one measure does not imply failure of the complete Mapping strategy, because a single measure samples only part of the candidate event. However, a locked multidimensional model that repeatedly fails to distinguish independently characterized states under conditions of adequate measurement has failed at the level actually tested. Such failure must be recorded rather than rescued retrospectively by introducing unspecified hidden variables. A revised model is a new model and requires new independent validation.

The converse case is equally important. Biological differences do not automatically imply phenomenological differences. Many biological variables may reflect prerequisites, support processes, downstream consequences, or unrelated organismic activity. [62, 64] If an identity-relevant biological model prospectively predicts a phenomenal distinction that is repeatedly absent under an adequately sensitive independent state criterion, that result also weighs against the corresponding model. The Mapping

programme must therefore identify not merely biological covariation, but which dimensions of biological organization carry specific and reproducible information about independently characterized phenomenal differences.

The present Friction Signature programme is therefore formulated as a multidimensional measurement architecture but cannot be assumed to be exhaustive. Whether that multidimensional architecture provides reproducible explanatory or predictive value beyond simpler alternatives remains an empirical question. Metabolic, autonomic, network, ionic, temporal, and dynamical measurements can each provide evidence about portions of the biological trajectory, but no current measurement family should be treated as a complete readout of the entire event. [33–35, 42, 90, 91, 112, 118–121] Particular states such as fear, pain, rumination, focused attention, grief, or relaxed awareness should therefore not be declared in advance to possess unique established Friction Signature trajectories. The framework predicts structured biological differences among appropriately chosen states; the existence, dimensional structure, generalizability, and specificity of those profiles remain empirical questions.

The earlier three-level distinction can now be stated in its mature form. **Primary phenomenology** is the target whose variation must be independently characterized. The **complete bounded organism-relative biological event** is the proposed identity counterpart. A **Friction Signature** is the operational measurement representation used to test selected biological dimensions of that event. **Narrator-level interpretation and report** are additional processes that may provide evidence concerning the state but are neither phenomenology itself nor the biological event to which phenomenology is proposed to correspond.

A successful Mapping programme would therefore do progressively more than show correlation. It would demonstrate that independently characterized phenomenal distinctions correspond prospectively to independently measured biological distinctions; that the correspondence survives changes in task, participant, measurement method, and perturbational context; that simpler behavioural, metabolic, or single-marker explanations do not account for the same results; that dissociations and boundary cases are correctly predicted; and that manipulation of the candidate organization changes the corresponding state in the predicted direction.

Such results would progressively narrow the admissible biological models and increase the evidential warrant for the proposed identity. They would not turn strict identity into an assumption. They would make identity an increasingly constrained empirical conclusion.

The purpose of defining a distinct phenomenological state is therefore not to stipulate a lawful biological relation in advance. It is to create an independent target against which that relation can fail.

17.6 Friction Signatures as an Operational Measurement Representation

The Mapping Theorem requires an empirical means of constraining the biological event proposed to correspond to primary phenomenology. Within the present framework, that role is assigned to **Friction Signatures**. A Friction Signature is not the complete bounded organism-relative biological event, is not primary phenomenology, and is not an intermediate product that is subsequently converted into experience. It is an operational, multidimensional measurement representation constructed from selected observable or inferable features of the biological event and its supporting organization.

This distinction is essential because the complete biological event is richer than any currently available measurement set. An experiment may sample metabolic activity, electrophysiological organization, autonomic regulation, network dynamics, temporal structure, or thermodynamic consequences, but no such measurement family should be assumed to provide exhaustive access to the event. Friction Signatures therefore function as empirical constraints on the biological side of the proposed identity relation rather than as complete physical descriptions of the organism.

The term *state-vector* may still be used later in the quantitative operationalization, but only in a restricted model-space sense. It denotes an ordered vector of selected operational variables used to represent aspects of a candidate state. It does not imply that the vector specifies the organism's complete physical microstate, that the relevant biological event is fully observable, or that all components share common physical units or metric structure. The exact vector construction, transformations, component definitions, and validation rules belong to Section 18.

The present measurement strategy is deliberately multidimensional because no single currently established candidate variable can be treated as a specific or exhaustive marker of primary phenomenology or of the complete bounded event. Whether this multidimensional architecture provides incremental empirical value beyond simpler alternatives remains an open question to be tested. Heart rate changes during many physiological conditions. Glucose use and oxygen consumption change across numerous forms of neural and bodily activity. Electrical activity, ion flux, cerebral blood flow, BOLD signal, local temperature, and network connectivity are each influenced by processes that extend beyond the phenomenal distinction under investigation. Thermodynamic entropy production is more abstract still: in an open living system it generally requires explicit system boundaries, timescales, physical variables, and modelling assumptions rather than being read directly from one biological signal. [33–35, 42, 44, 112, 118, 120, 121]

For this reason, candidate Friction Signature measurements must retain their physiological meanings. Metabolic and energetic measurements, ionic or electrophysiological measurements, autonomic or regulatory measurements, network and dynamical measurements, temporal measurements, and thermodynamic estimates are not interchangeable simply because each can vary during a biological event. Nor does placing heterogeneous variables on a common normalized scale make them biologically commensurable. Their evidential value depends upon what each measure actually records, what physiological process it indexes, whether it is direct or model-derived, and how it relates to the independently characterized state being tested.

The same restriction applies within measurement families. BOLD signal is not glucose utilization or ATP turnover. Cerebral blood flow is not itself metabolic rate. A local temperature change is affected by both heat production and heat transfer and cannot automatically be interpreted as a direct measure of ATP-derived heat. Acute heart-rate variability, respiration, skin conductance, blood pressure, or endocrine changes are not equivalent to cumulative allostatic load. Neural or signal complexity measures are not measures of thermodynamic entropy production. These distinctions are not peripheral technicalities; they determine whether a proposed Friction Signature component has a stable biological meaning. [35, 42, 44, 112, 118, 120, 121]

The framework therefore does not require every relevant biological dimension to move in a common direction. A state may involve increased activity in one measure, reduced activity in another, altered coupling in a third, and a change in persistence or transition structure that has no meaningful interpretation as a simple increase or decrease. Network reorganization is not inherently an energetic increase, and autonomic changes can be directionally heterogeneous. Friction Signatures should consequently be treated as **state-specific patterns of organized change**, not as scalar amounts of biological friction or consciousness.

This is particularly important for recursive cognition. Sustained worry or rumination may be associated with prolonged autonomic or endocrine activation and altered self-referential or control-network organization, but the framework must not infer from this that every Friction Signature dimension rises monotonically or that total organismic energy consumption necessarily increases in a simple proportional manner. The appropriate predictions are state-specific, dimension-specific, temporally defined, and prospectively testable. [12, 13, 21, 119]

Individual variation is likewise expected but cannot function as an unrestricted rescue clause. The biological organization associated with a controlled condition may vary with prior history, current physiology, medication, developmental factors, learned associations, fatigue, disease, and other organism-relative conditions. Such variation motivates calibration, stratification, repeated-measures designs, and appropriately defined statistical models. It does not permit a failed prediction to be retrospectively reinterpreted as successful merely because organisms differ. [22–24, 101]

The role of report must remain equally precise. Friction Signatures do not map to the sentence “I am afraid,” “I am in pain,” or “I am conscious.” Report is a downstream observation that can contribute to independent state characterization under a prespecified experimental design. It may be incomplete, memory-dependent, culturally shaped, or unavailable, but it cannot be dismissed selectively when it conflicts with the biological model. As established in Section 17.5, the state-identification criterion and the biological predictor must be separated sufficiently to permit a genuine test. [30, 31, 62, 64, 191–194, 208, 211]

Nonverbal paradigms present the same methodological problem rather than eliminating it. Behaviour, discrimination performance, controlled perceptual manipulation, clinical observation, or validated no-report procedures may provide evidence relevant to state classification, but none is automatically identical to primary phenomenology. The evidential role of each measure must be determined by the paradigm in which it is used. [30, 31, 62, 64, 191–194]

Friction Signatures therefore occupy a deliberately limited but important position in the Mapping architecture. They translate selected biological dimensions into a form that can be measured, compared, modelled, and prospectively tested. Their value lies not in replacing the complete event with a vector, but in progressively constraining which biological organizations remain compatible with the proposed identity relation.

The controlling hierarchy is therefore:

$$\text{complete bounded organism-relative biological event}$$
$$\leftrightarrow$$
$$\text{primary phenomenology}$$

$$\text{Friction Signature measurement representation}$$
$$\neq$$
$$\text{complete bounded organism-relative biological event}$$

Section 18 will formalize the candidate operational dimensions, transformations, state-specific trajectories, anchor models, and validation rules through which this measurement representation can be tested.

17.7 The Stochastic Pump as Physical Support Architecture

Friction Signatures provide empirical access to selected dimensions of the candidate biological event. The Stochastic Pump addresses a different question: how the living system physically maintains, recruits, perturbs, coordinates, contains, and restores the conditions required for such bounded events to occur.

The Stochastic Pump is therefore retained here in the precise sense established in Section 6: **the framework’s proposed systems-level support architecture organizing established distributed biological work**. It is not a new molecule, force, anatomical controller, thermodynamic substance, or independently established consciousness mechanism. It does not generate phenomenology, and it does not directly generate a Friction Signature as a biological product.

The distinction can be stated schematically:

established biological mechanisms
$\rightarrow$
Stochastic Pump support organization
$\rightarrow$
complete bounded biological event

while empirical measurement proceeds separately:

selected measurable consequences and state variables
$\rightarrow$
Friction Signature measurement representation

The first relation concerns biological organization. The second concerns measurement and analysis. Conflating them would turn an operational representation into an ontological component of the event.

The biological work organized under the Stochastic Pump construct is distributed across mechanisms and timescales. ATP-dependent maintenance and restoration of electrochemical gradients are important examples, particularly in excitable tissues, but they do not exhaust the construct. Event support can also depend upon metabolic supply, calcium regulation, transmitter and solute transport, glial regulation, vascular or hydraulic support, mechanical preparation, endocrine and autonomic regulation, molecular repair, clearance, and restoration of functional availability. Which mechanisms are relevant depends upon the organism, tissue, and event under study. [24, 32–35, 42, 65, 77–86, 90, 91, 109, 111]

This distributed support begins before the most visible state-transition. A neuron cannot fire without previously maintained ionic gradients; an excitable plant tissue cannot recruit rapid electrical and mechanical responses without prior electrochemical, hydraulic, metabolic, and structural preparation. During an event, the same maintained conditions are recruited and disturbed. Afterward, altered gradients, resources, regulatory variables, or tissue conditions may require restoration or reorganization before the system regains sufficient availability for subsequent events. [33–35, 65, 77–86, 90, 91, 111]

The Pump therefore addresses a systems problem rather than a single energetic quantity. Living systems must remain capable of consequential transformation while operating under finite resources, leakage, molecular variability, thermal fluctuation, and changing environmental and internal conditions. The term *stochastic* refers to the fact that relevant biological operations occur in the presence of noise and probabilistic variability; it does not imply that every participating process is random or that the system lacks deterministic causal structure. The term *Pump* refers to the continuing organization of work required to preserve and renew the physical differences upon which regulated responsiveness depends. [24, 32–35, 108]

This support architecture is compatible with different forms of state-transition. Some biological events involve threshold-dependent commitment. Others may be better described through graded integration, recurrent dynamics, metastable organization, or stabilization within a changing regime. The Mapping Theorem therefore does not require one universal threshold mechanism. What matters for the Pump construct is that the relevant event depends upon actively maintained physical conditions whose recruitment and restoration can be decomposed and empirically investigated.

The same point constrains interpretation of energetic cost. Biological work is indispensable to the supported event, but energy magnitude alone does not specify the event's organization or phenomenal character. Similar energetic expenditure can accompany biologically different processes, while events with different phenomenal significance may involve different distributions of work rather than simply different totals. The Pump therefore prevents the framework from treating metabolism as an inert background, but it does not license the converse reduction of phenomenology to metabolic expenditure. [32–35, 42]

Recursive cognition provides an important higher-level case. Memory-dependent thought can become a present internal condition and thereby alter attention, autonomic regulation, endocrine activity, network dynamics, action preparation, and subsequent biological processing. Recursive recruitment can prolong an event, but it can also redirect, attenuate, terminate, or reorganize later processing. Rumination and sustained worry are particular cases in which recursive activity may contribute to persistence; they should not be treated as the general form of recursion. [9, 10, 12, 13, 21, 114–116]

Friction Signature measurements can be used to examine the biological consequences associated with this support architecture and the events it helps sustain. Metabolic, electrophysiological, autonomic, network, temporal, thermal, or thermodynamic observations may each constrain different parts of the process. They should not be collapsed into a single quantity called "cost," and the Stochastic Pump should not be inferred directly from any one of them. [35, 42, 44, 112, 118, 120, 121]

The scientific status of the Pump must remain vulnerable to evidence. Because the construct is systems-level rather than molecular, it must remain decomposable into established biological operations and must earn explanatory value beyond merely renaming those operations. If the proposed Pump organization yields no reproducible causal, comparative, or predictive constraint beyond a list of its components, its role should be reduced, revised, or abandoned. Conversely, if the organization captures reproducible relations among readiness, event-specific recruitment, controlled perturbation, containment, resolution, and renewed availability across distinct biological implementations, it gains systems-level explanatory value without becoming a separate physical entity.

The Stochastic Pump therefore strengthens the Mapping programme only in a restricted sense. It grounds the candidate event in materially supported living dynamics and identifies experimentally tractable dependencies that can be perturbed and measured. It does not bridge biology to phenomenology by causal conversion. The proposed identity relation remains between primary phenomenology and the complete bounded organism-relative biological event; the Pump specifies part of the physical support architecture through which that event is possible.

17.8 The Proposed Mapping Relation

The preceding subsections permit the central relation to be stated without collapsing ontology, measurement, and phenomenology into one another. Three analytically distinct terms are required.

The first is the **complete bounded organism-relative biological event**: the independently specified candidate physical unit.

The second is the **Friction Signature measurement representation**: a selected and necessarily incomplete operational representation used to obtain empirical access to dimensions of that biological event.

The third is **primary phenomenology**: the independently specified organism-relative inside-view target, prior to its equation with the biological event.

The Mapping Theorem proposes an identity relation between the first and third terms. It does not propose an identity between the Friction Signature and phenomenology, and it does not treat the Stochastic Pump as an intervening producer that converts one into the other.

Under the strong identity hypothesis, primary phenomenology is not an additional product emitted by the biological event after the event has been physically completed. Nor is the complete event a hidden substrate upon which a second phenomenal property is causally painted. Rather, the hypothesis is that the relevant complete organism-relative biological occurrence and its primary phenomenal aspect are one event described under biological and phenomenal characterization.

That claim is deliberately stronger than a correlation claim, but its evidential burden is correspondingly greater. The theorem cannot infer identity merely because a neural, autonomic, metabolic, or network variable covaries with reported experience. Nor can it infer identity merely because a biological perturbation alters report. Correlation, temporal alignment, causal dependence, necessity, sufficiency, and identity represent different evidential levels and must remain distinct.

Friction Signatures enter this relation through a measurement model. They sample selected dimensions of the candidate event and permit prospective biological predictions to be tested against independently characterized states. The measurement model can succeed or fail without being identical to the deeper ontological proposition. This distinction allows the theorem to remain falsifiable without pretending that any single instrument or operational vector exhausts the biological event.

Two kinds of entailment must therefore be separated.

At the **identity level**, if two primary phenomenal states are genuinely different, the identity hypothesis entails that the corresponding complete biological events cannot be identical in every identity-relevant respect. Some difference in the complete event must correspond to the phenomenal difference if the two are genuinely one occurrence under different characterization.

At the **measurement-model level**, a particular Friction Signature model predicts that specified observable dimensions will detect, classify, track, or prospectively distinguish the relevant biological difference under defined experimental conditions. That is a stronger operational commitment than the abstract identity entailment because it specifies what current measurements should reveal.

Failure of a particular measurement variable therefore need not immediately falsify the identity proposition. It may show that the selected measure was nonspecific, insensitive, poorly timed, or unrelated to the identity-relevant organization. But this distinction cannot become an unlimited rescue strategy. Once a multidimensional model has been specified, calibrated, and frozen, failure on independent data remains failure of that model. A revised model constitutes a new model generation and requires new independent validation. Repeated failure across increasingly adequate and independently tested representations progressively weakens the broader Mapping strategy. [211]

The converse relation is equally constraining. A detectable biological difference does not automatically entail a phenomenological difference. Biological events contain prerequisites, support processes, downstream consequences, compensatory processes, and other changes that may not correspond directly to phenomenal variation. A viable Mapping model must therefore specify which biological features are proposed to be identity-relevant and which are measurement context, support, or consequence.

For this reason, the theorem does not adopt a generic reciprocal-covariation rule in which any biological change may be matched after the fact to any change in phenomenology, access, report, intensity, or recursive availability. Such a rule would be too permissive to fail. Each empirical test must instead specify in advance the state contrast, the state-identification criterion, the biological measurements, the predicted dimension and direction of change where direction is meaningful, the temporal relation, the allowed dissociations, and the result that would count against the model. [211]

The narrator remains outside the primary identity relation without being outside biology. Recognition, ownership, autobiographical reconstruction, metacognition, and report can have their own biological implementations and their own measurable consequences. They can also influence later primary events through recurrent causal interaction. But a model of L2 access cannot be substituted for a model of primary phenomenology, and successful prediction of report does not by itself establish successful mapping of the primary phenomenal target. [30, 31, 62, 64, 191–194, 208]

The same restriction applies to named experiential categories. Fear, pain, rumination, focused attention, grief, panic, or relaxed awareness cannot be defined by the same physiological variables later used to demonstrate their Mapping. The experimental state must be characterized independently enough to create a genuine prediction problem. Section 18 therefore develops state-specific operational models only after the target conditions and comparison logic have been specified. [211]

The theorem's strongest scientific contribution is thus not the assertion that biology and phenomenology are related; that is already compatible with many positions. The stronger proposal is that the relation can be progressively constrained at the level of the complete bounded organism-relative event until alternative mappings lose explanatory freedom. Multidimensional measurement, controlled perturbation, dissociation, cross-condition invariance, simpler-model comparison, and prospective validation are the means by which that reduction in explanatory freedom can occur.

A successful programme would therefore show more than retrospective fit. Independently characterized phenomenal states would correspond to independently measured biological organizations in prospectively specified ways; the relation would survive changes in measurement method, participant, manipulation, and context; simpler single-marker or behavioural explanations would fail to account for the same structure; and targeted perturbations would alter the predicted biological and phenomenal dimensions with the expected temporal ordering.

Such evidence would not prove strict identity in one experimental step. It would progressively narrow the class of biologically admissible alternatives and strengthen the identity proposition by making weaker correspondence accounts increasingly inadequate. Conversely, repeated prospective failure at the appropriate level would require revision of the measurement model, the candidate event architecture, or ultimately the Mapping strategy itself.

The Mapping Theorem therefore formulates a testable identity programme rather than a definitional identity. The complete biological event is specified independently. Primary phenomenology is specified independently. Friction Signatures provide incomplete but potentially convergent third-person measurement access to the biological event. The Stochastic Pump provides a proposed systems-level account of the event's physical support conditions. The remaining task is empirical: determine whether the independently specified biological and phenomenal domains can be constrained strongly enough, across perturbations and boundary cases, to justify progressively stronger identity language.

Section 18 takes up that task quantitatively.

17.9 Lower Perturbational Constraint: Reversible Suppression

A proposed identity relation becomes scientifically more informative when the candidate biological organization can be perturbed reversibly and the consequences can be examined across induction, maintenance, and recovery. For the Mapping Theorem, reversible suppression therefore provides a lower perturbational constraint. Its role is not to prove identity from the disappearance of report or behaviour. Its role is to test whether experimentally induced changes in the candidate biological organization are accompanied by the predicted changes in independently characterized phenomenal state and in downstream access-related functions.

General anesthesia provides an especially useful experimental setting because the intervention is reversible, its pharmacological conditions can be controlled, and neural, physiological, behavioural, and report-related variables can be followed across changing levels of responsiveness. The relevant evidence, however, is heterogeneous across agents, doses, individuals, and endpoints. Behavioural unresponsiveness cannot be treated as equivalent to absence of primary phenomenology, and lack of later recall cannot by itself establish that phenomenology was absent at the time. Ketamine is a particularly important boundary case because profound unresponsiveness can coexist with retrospectively reported experience and relatively preserved perturbational complexity, whereas other anesthetic conditions can produce markedly different dynamical profiles. The lower constraint must therefore be formulated at the level actually measured rather than by treating "anesthesia" as one homogeneous conscious or unconscious state. [39, 40, 74, 75]

The same caution applies to the biological side of the comparison. Anesthesia does not stop biological activity. Cellular metabolism, circulation, ionic regulation, and many local neural operations continue. What changes, depending on agent and depth, are particular forms of large-scale organization, effective interaction, dynamical complexity, thalamocortical and cortical coordination, sensory propagation, temporal organization, autonomic regulation, and access-related function. These are not interchangeable variables and need not move in parallel. Their value for the Mapping programme lies in whether a prespecified subset of them constrains the candidate bounded event more successfully than simpler alternatives such as drug concentration, behavioural responsiveness, or a single neural marker. [38–40, 50, 55, 60, 74, 75]

This distinction prevents a second error: the Friction Signature is not itself the architecture being suppressed. Friction Signature variables are measurements used to represent selected dimensions of the changing biological organization. A lower-anchor test therefore has the form of a perturbation of the candidate biological system followed by measurement of its consequences, not a perturbation of a measurement vector.

The phenomenal and access-related predictions must also remain separate. If a perturbation selectively disrupts biological organization hypothesized to be relevant to primary phenomenology, the framework predicts a corresponding change in phenomenal availability or phenomenal character. If a perturbation primarily disrupts downstream recursive, mnemonic, or report-related organization, the framework predicts changes in recognition, ownership, recall, command following, or report without requiring that primary phenomenology change in exactly the same way. The Mapping Theorem therefore does not treat L2 access as a surrogate definition of L1 phenomenology.

Motor disconnection provides an important dissociation constraint. Locked-in syndrome demonstrates that severe impairment of behavioural output can coexist with preserved consciousness and cognition. This blocks any version of the lower anchor that equates absent behaviour with absent phenomenology. Relatedly, sleep, sedation, paralysis, dissociative states, and anesthetic states can each alter different combinations of sensory processing, phenomenal content, memory, self-reference, responsiveness, and report. A scientifically useful perturbational constraint must predict these layered dissociations rather than collapsing them into a single conscious/unconscious axis. [46, 51, 52, 59, 73–75, 160, 161]

Disorders of consciousness require the same discipline. Unresponsive wakefulness syndrome, minimally conscious state, coma, and related clinical categories are behaviourally defined and biologically heterogeneous, and covert cognition or covert consciousness can be missed by bedside behaviour alone. Such conditions can constrain the Mapping framework, but they cannot be used as simple demonstrations that behavioural silence equals phenomenal absence. Their strongest value lies in graded and dissociative evidence concerning which forms of biological organization are preserved, disrupted, or recoverable under conditions in which overt access is uncertain. [31, 53, 54, 181–186]

Recovery is similarly not expected to occur as one simultaneous restoration. Empirically measured endpoints such as neural responsiveness, effective connectivity, signal or perturbational complexity, behavioural responsiveness, orientation, and memory can recover on different timescales. Within the present framework, such differentiated recovery is compatible with the expectation that stable narrator-level access need not return simultaneously with earlier biological, cognitive, or behavioural endpoints; narrator-level access itself, however, is a framework-level interpretation rather than a directly measured endpoint in the cited recovery literature. The Mapping programme should therefore avoid synthetic universal recovery latencies assembled from non-equivalent endpoints. Where temporal claims are made, the relevant endpoint, agent, measurement, and state criterion must be specified prospectively. [40, 50, 53–55]

The lower perturbational constraint can therefore be stated without assuming the identity proposition it is meant to test. If a prespecified candidate biological organization is genuinely relevant to primary phenomenology, then controlled perturbation of that organization should produce reproducible, state-specific changes in independently characterized phenomenal state, subject to the known limitations of the state criterion. If the manipulation instead changes only downstream access, memory, behaviour, or report, then those consequences should remain distinguishable from changes in primary phenomenology. Restoration should likewise reproduce the predicted biological and phenomenological trajectory rather than merely restore one behavioural endpoint.

Successful reversible covariation would strengthen evidence for biological dependence and for the adequacy of the candidate event model. It would not, by itself, establish strict identity. Correlation, reversible dependence, causal modulation, necessity, sufficiency, and identity remain distinct evidential levels. The lower constraint becomes stronger as alternative explanations are excluded, as dissociations are survived, and as the same locked biological model predicts independent transitions without post hoc redefinition.

The philosophical-zombie consequence discussed earlier in the manuscript should be kept logically downstream of this evidence. Within the proposed identity architecture, subtracting phenomenology while holding the complete identity-relevant biological event fixed is inconsistent with the hypothesis by construction. That is a framework consequence, not independent empirical evidence for the identity proposition, and the reversible-suppression literature should not be used circularly to convert it into one.

Detailed quantitative implementation of the anesthesia constraint belongs to Section 18.3. The role of the present subsection is narrower: to establish reversible, agent-specific, dissociation-sensitive perturbation as one of the principal ways the Mapping relation can be constrained and potentially weakened.

17.10 Upper Perturbational Constraint: Sustained Recursive Load

The complementary perturbational constraint examines a different regime. Rather than suppressing biological organization associated with ordinary waking function, it asks whether sustained recursive self-referential and perseverative processing can be independently identified and whether its biological consequences form a reproducible, temporally extended measurement trajectory. This is the upper constraint of the present Mapping architecture only in the sense of sustained recursive load. It is not an upper bound on phenomenology, an index of “more consciousness,” or a claim that greater biological expenditure implies greater phenomenal magnitude.

The target must therefore be narrow. Recursive cognition in general is not the upper-anchor state. Memory, planning, practical reasoning, focused attention, prediction, and self-reference can occur without becoming perseverative or maladaptively persistent. The relevant comparator is sustained self-referential or perseverative processing of the kind instantiated in rumination and related forms of persistent cognitive recurrence. Within the framework, this state is interpreted as a form of recursive audit and psychological-time organization, but those labels are theoretical interpretations rather than independently established neuroscientific entities.

Existing evidence supports a limited but important biological premise. Perseverative cognition is associated with prolonged cardiovascular, autonomic, and endocrine changes, with substantial heterogeneity across state versus trait measurement, induction method, population, baseline physiology, and the variable selected. Neuroimaging studies and meta-analytic work also support involvement of self-referential and default-mode-related systems in rumination and perseverative cognition. These findings are better described as state- and subsystem-specific reorganization than as uniform global elevation. [12, 13, 21, 119]

The evidence does not presently justify treating all candidate Friction Signature dimensions as a single dissipative-cost scale. Acute heart rate, heart-rate variability, blood pressure, respiration, skin conductance, and cortisol are regulatory or physiological

variables; they are not equivalent to cumulative allostatic load. BOLD and cerebral blood-flow measures are hemodynamic and should not be treated as direct measurements of glucose utilization, oxygen consumption, ATP turnover, or total metabolic power. Network connectivity and dynamical stability are organizational variables rather than energetic quantities. Thermodynamic entropy production is a separate inferred physical quantity requiring explicit boundaries and modelling assumptions. Direct metabolic and whole-event thermodynamic validation of state rumination therefore remains an empirical task rather than an established result. [35, 42, 112, 118, 120, 121]

The upper constraint consequently predicts a structured trajectory, not universal elevation. For a prespecified sustained-recursion paradigm, individual biological measures may increase, decrease, remain stable, or reorganize. What matters is whether the target state is associated with a reproducible biological pattern or trajectory—multivariate where the prospectively retained model contains multiple biological components—that is defined in advance, tracks induction and persistence, changes with disengagement or resolution, and generalizes beyond the dataset in which it was developed. No direction should be assigned merely because it sounds compatible with "more load." Each retained measure requires a state-specific and preregistered expectation.

This makes focused practical attention one of the strongest dissociation tests available to the upper constraint. A demanding task can recruit sustained cognition, neural activity, metabolic support, and attentional control without necessarily producing self-referential perseveration. [33–35, 68] If the proposed upper-anchor architecture cannot distinguish rumination from equally sustained but non-ruminative practical attention, then it has not isolated recursive perseverative load. The same logic motivates additional controls for negative affect without rumination, self-reference without perseveration, sustained cognition without self-reference, ordinary mind-wandering, and, where scientifically appropriate, worry as distinct from rumination.

Meditative states can provide additional contrasts, but they cannot be assigned one universal biological direction. Different practices, expertise levels, populations, baselines, and measurement methods produce heterogeneous neural and physiological patterns. Their value is therefore conditional: where a particular practice is independently shown to reduce self-referential perseveration, the framework can prospectively ask whether the biological dimensions associated with the sustained-recursion model reorganize accordingly while sensory, attentional, or task-related activity may remain preserved or even increase. [36, 37, 43, 59, 149]

The same separation required in Section 17.5 applies here. Rumination or perseverative state must be identified independently of the biological variables used to predict it. Subjective ratings, task instructions, recurrence, duration, and difficulty disengaging may contribute to the state criterion, but they cannot then be recycled without qualification as independent biological predictors of that same state. [211] The operational sequence remains:

$$\begin{gathered}\text{independent sustained-recursion criterion}\\ \rightarrow\\ \text{state classification}\\ \rightarrow\\ \text{prespecified biological prediction}\\ \rightarrow\\ \text{independent test}\end{gathered}$$

A successful upper-anchor model would therefore do more than show that rumination has physiological correlates. It would identify a prespecified biological measurement architecture that distinguishes sustained perseverative self-reference from appropriate comparison states, tracks persistence and disengagement, survives participant and task holdouts, and provides value beyond the strongest single marker or simpler explanatory model. A failed locked model must remain failed; revising variables, signs, transforms, or thresholds after seeing the result creates a new model requiring new independent validation. [211]

The upper constraint complements the lower constraint because it challenges the Mapping framework under a substantially different perturbational regime. The lower constraint asks whether reversible suppressive disruption reorganizes candidate biology and phenomenal/access outcomes in the predicted way. The upper constraint asks whether sustained recursive persistence produces a distinct and reproducible biological trajectory without being reducible to generic cognitive effort, arousal, negative affect, or report. The two constraints need not be numerical inverses, need not share identical component directions, and should not be interpreted as opposite ends of a scalar consciousness continuum.

Success across both regimes would narrow the class of admissible biological models by requiring one coherent Mapping architecture to survive suppressive disruption and sustained recursive persistence without changing the meaning of its central constructs. That would strengthen the empirical case for the Mapping programme. It would still not independently prove strict phenomenological identity. The evidential gain lies in increased constraint, successful dissociation, reproducibility, prospective prediction, and reduced explanatory freedom.

Detailed quantitative operationalization of the sustained-recursion constraint belongs to Section 18.4. The present subsection establishes only the conceptual role of the upper constraint and the empirical boundaries that must govern its later implementation.

17.11 Directional Predictions and Boundary-Case Dissociations

The lower and upper perturbational constraints developed above do not imply a single axis running from "less consciousness" to "more consciousness." Their value is instead comparative. Reversible suppression tests what happens when candidate biological organization is disrupted or uncoupled, whereas sustained recursive load tests what happens when a particular form of self-referential and perseverative processing is maintained over time. Taken together, they require the Mapping Theorem to predict structured differences among states rather than merely associate phenomenology with the presence of biological activity.

The appropriate prediction space must preserve the distinctions already established in this section. A Friction Signature is an operational measurement representation of selected biological dimensions. Primary phenomenology is the independently characterized phenomenal target. L2 recursive access, ownership, memory-based interpretation, and report are downstream variables. These three classes cannot be placed inside one undifferentiated "state-space" and then treated as equivalent components of a single vector.

The resulting cross-domain prediction architecture therefore has three analytically separate parts: **biological measurement representation**, **primary-phenomenology target**, and **L2/access outcome**. The theorem predicts lawful relations among them, but does not define one by the other. A biological measurement pattern must be specified independently enough to be tested against an independently characterized state, while access and report must remain available as additional outcomes rather than being silently used as substitutes for phenomenology.

This separation changes the purpose of a directional-convergence matrix. The matrix is not a completed evidence table and it does not assign final biological values to named experiences. It is a set of **prospective qualitative predictions** whose content must later be operationalized state by state. Terms such as *increased*, *reduced*, *preserved*, *reorganized*, *uncoupled*, *persistent*, and *state-dependent* are therefore provisional directional descriptors, not numerical quantities. Confirmatory use requires each relevant descriptor to be translated into a prespecified measurement, comparison condition, time window, expected configuration, and failure rule.

The most informative predictions are dissociative. A useful Mapping model should not merely distinguish obviously different conditions; it should survive cases in which one observable layer changes while another is preserved. The following matrix therefore emphasizes contrasts capable of separating biological organization, primary phenomenology, and downstream access.

Condition or contrast	Predicted biological measurement relation	Primary-phenomenology target	L2 / access outcome	Critical Mapping constraint
Calm or relaxed wakefulness	Relatively stable state-specific organization without presupposing globally minimal biological activity	Present	Available without requiring persistent self-reference	Provides a wakeful comparison state rather than a universal zero point
Focused practical attention	Task-specific biological recruitment that need not resemble perseverative self-reference	Present and task-directed	Functional; irrelevant self-reference may be reduced	Sustained cognition must be distinguishable from rumination rather than counted as equivalent recursive load
Sustained rumination / perseverative self-reference	A temporally persistent, state-specific biological departure predicted across the prespecified biological measures retained in the tested model, including network, regulatory, dynamical, or biological-temporal measures where prospectively included	Present, with state content determined independently of the biological predictor	Strongly recruited self-referential access is expected by the framework	The biological model must separate rumination from focused attention, generic negative affect, ordinary mind-wandering, and self-reference without perseveration [12, 13, 21, 119]
Acute fear versus sustained rumination	Both may involve strong organismic change, but their temporal and recursive organization should differ	Present in both, with distinct phenomenal character independently characterized	Recursive ownership may follow acute fear but is predicted to be more persistent in rumination	A brief threat response must not be collapsed into sustained recursive load merely because autonomic or other markers overlap [11–14, 21]
Meditation / reduced self-reference	Practice-specific reorganization is predicted rather than universal suppression of biological activity	Phenomenology may remain present while self-referential persistence changes	Narrator-dominant processing may be reduced without requiring loss of practical cognition	Reduction of self-reference must not be interpreted as reduction of phenomenology itself [36, 37, 43, 59, 149]
Psychedelic ego dissolution	Candidate biological organization is predicted to differ from both ordinary wakefulness and suppressive anesthesia; exact direction is measure- and drug-specific	Phenomenology may remain vivid despite altered self-model organization	Ownership/self-model organization may loosen or fragment	Disruption of narrator organization must be dissociable from suppression of primary phenomenology [45, 166, 167]
Strong suppressive anesthesia	Agent- and depth-specific disruption or reorganization of candidate biological processes is predicted; no generic one-marker profile is assumed	Availability or character of primary phenomenology must be independently constrained rather than inferred from unresponsiveness alone	Access, memory, ownership, command following, and report may be markedly degraded	Behavioural unresponsiveness cannot define phenomenal absence; agent-specific dissociations, including disconnected consciousness, must be accommodated prospectively [38–40, 74, 75]

Locked-in syndrome	Biological organization supporting consciousness is predicted to remain unlike a genuinely suppressive state despite severe motor-output impairment	Preserved	Preserved in principle despite severely restricted behavioural expression	Motor output and ordinary report cannot be necessary conditions for primary phenomenology [73, 160, 161]

The table deliberately avoids several claims made by the earlier formulation. It does not place primary phenomenology inside the Friction Signature. It does not place narrator-level access inside the biological predictor. It does not treat autonomic regulation as synonymous with cumulative allostatic load. It does not treat neural or signal complexity as thermodynamic entropy production. It does not assume that metabolic, network, autonomic, dynamical, and temporal variables are commensurable measures of one common quantity called biological "cost."

The focused-attention/rumination comparison is especially important because it challenges a major alternative explanation. If the putative upper-anchor pattern merely tracks cognitive effort, task duration, or sustained attention, then the Mapping programme has not isolated sustained recursive self-referential processing. A stronger result requires the prespecified biological model to distinguish rumination from equally demanding but non-ruminative cognition and from negative affect without perseverative self-reference.

The meditation/anesthesia and psychedelic/anesthesia contrasts test a different possible confusion. Reduced or disrupted self-reference does not by itself imply reduced primary phenomenology. A model that treated L2 attenuation as equivalent to phenomenal suppression would predict the wrong architecture for conditions in which self-model organization changes while vivid phenomenal content is preserved. Conversely, strong suppressive states test whether candidate primary-event organization can be disrupted without merely removing the ability to report.

Locked-in syndrome supplies an output dissociation. Severe motor impairment can make ordinary behavioural expression unavailable while leaving consciousness and cognition preserved. The Mapping Theorem must therefore locate the relevant biological constraints upstream of motor expression. A biological model that classifies motor-output failure as phenomenal absence would fail this boundary condition.

Acute fear and sustained rumination provide a temporal and recursive dissociation. They may share some regulatory or physiological consequences, yet the Mapping architecture predicts that persistence generated through repeated memory-dependent self-reference should be distinguishable from a brief organism-relative threat response. This is precisely why the temporal dimension cannot be reduced to elapsed clock time alone: the relevant empirical question concerns persistence, recurrence, dwell, disengagement, and resolution within a specified biological and cognitive state.

These contrasts are not yet validated state-specific biological signatures. They are framework predictions whose empirical maturity differs by condition and measurement family. During the final evidence audit, every state-specific claim must therefore be classified as directly supported, mixed, inferential, unresolved, or prospective. An empirically unresolved cell is not permitted to become confirming evidence simply because its predicted direction seems plausible.

The prediction architecture also imposes an anti-rescue constraint. Before a confirmatory test, the state criterion, biological variables, directional or pattern-based expectations, time window, comparison state, allowable covariates, and failure conditions must be specified. If a predicted pattern fails, an unplanned contextual explanation cannot simply be introduced to preserve the original model. A revised interpretation or measurement architecture constitutes a new model and requires new independent validation. [211]

Directional convergence would therefore be informative only if it reduces explanatory freedom. Reproducible biological separation of independently characterized states can support the measurement architecture and constrain the biological candidate. Surviving dissociations can further narrow rival explanations. Neither achievement alone establishes strict identity, because a non-identity theory can also predict biological dependence and state discrimination. The identity proposition gains stronger warrant only as the same constrained biological architecture survives independent state definition, temporal ordering, dissociation, cross-condition invariance, prospective prediction, intervention, simpler-model comparison, and increasingly stringent necessity or sufficiency tests where those are scientifically achievable.

The role of the present subsection is therefore qualitative but substantive. It identifies the contrasts that a successful Mapping model must explain **without changing the meaning of its constructs from one state to another**. The quantitative implementation of those predictions, including the exact Friction Signature dimensions, observed measures, transformations, state-specific profiles, and validation thresholds, belongs to Section 18.

17.12 Formal Bridge to Quantitative Operationalization

The Mapping Theorem now requires a formal bridge from the conceptual identity proposition to an empirical measurement programme. That bridge must be strong enough to generate prospective tests while remaining modest enough not to confuse a measurement representation with the complete biological event or with primary phenomenology.

The biological target remains the **complete bounded organism-relative biological event**. Primary phenomenology remains the independently specified organism-relative inside-view target. The Friction Signature remains a selected operational measurement representation used to obtain third-person access to dimensions of the biological event. The formal task is therefore not to write phenomenology as a mathematical function of a Friction Signature. It is to specify how observed biological measurements can be

organized into testable representations of a candidate event and then compared prospectively with independently characterized phenomenal states.

This distinction requires two different relations to remain separate. At the theoretical level, the Mapping Theorem proposes an identity relation between the complete event and primary phenomenology. Schematically:

$$B\_event \leftrightarrow P\_primary$$

This is an ontological proposition, not a fitted empirical equation. The bidirectional symbol indicates the proposed identity/correspondence of two independently specified characterizations; it does not imply a causal conversion from biology into phenomenology or an empirically demonstrated mathematical equivalence.

At the measurement level, instruments provide only partial observations of the biological event. A Friction Signature representation is therefore constructed from selected observed variables under explicit measurement and analysis rules. It cannot be assumed to exhaust the physical state of the organism. Nor does placing multiple variables in a common representation establish that they share units, metric structure, causal status, reliability, or biological meaning. [35, 42, 44, 112, 118, 120, 121]

The current programme proposes a shared multidimensional Friction Signature domain that can be expressed differently in different experimental states. The exact operational dimensions, observed measures, construction functions, state-specific transformations, baselines, and validation rules are introduced in Section 18. The present section does not duplicate that machinery. In particular, the shared domain does not require every anchor-specific model to instantiate every candidate dimension, nor does it require the two anchors to have identical component membership or dimensionality. Direct cross-anchor invariance evidence can be supplied only by domains prospectively retained in both relevant anchor-specific models under the same frozen theoretical meaning. The current dimensional decomposition is therefore not treated as exhaustive, as a set of independent causal mechanisms, or as an immutable theorem-level requirement. Prospective evidence may justify retaining, splitting, reducing, or replacing dimensions, but changes made after a failed locked test must be treated as a new model rather than a rescue of the old one. [211]

Temporal organization requires the same distinction. A temporal component within a measurement model can represent a prespecified feature such as persistence, recurrence, dwell time, hysteresis, disengagement, or resistance to resolution within a defined window. The **trajectory**, by contrast, is the temporally ordered evolution of the entire multivariate measurement representation. A temporal feature is therefore not equivalent to the trajectory that contains it.

Similarly, state differences should not be represented by raw subtraction of heterogeneous untransformed components. Before quantitative differences are meaningful, each observed variable must be mapped through a prespecified construction and state-appropriate transformation that defines what increase, decrease, preservation, or pattern change means for that measurement. Network topology, signal complexity, autonomic regulation, metabolic observations, and temporal persistence cannot be subtracted or summed merely because they have been placed beside one another in a vector. [35, 42, 44, 112, 118, 120, 121]

For the same reason, the directional profiles introduced in Section 17.11 remain qualitative prediction profiles rather than numerical vectors. Their function is to state what kind of biological distinction or dissociation the framework expects. Section 18 must convert only the retained state-specific predictions into operational quantities using frozen measurement definitions and appropriate transformations.

Any scalar index developed downstream is likewise a model choice rather than a consequence of the Mapping Theorem. A weighted additive score assumes additivity, compensability, and a particular relation among components. Those assumptions must be compared with simpler and alternative models rather than silently built into the ontology. The full multivariate trajectory retains priority whenever a scalar summary would obscure state-specific reorganization or asynchronous recovery.

This formal separation also protects against predictor–criterion circularity. Keeping primary phenomenology outside the Friction Signature representation is necessary but not sufficient. The phenomenal or state criterion used to evaluate a biological predictor must be independently characterized enough that the same biological measurements are not simultaneously used to define the target and then claimed to predict it. Where report, behaviour, discrimination, clinical classification, or no-report procedures are used to establish the target state, their roles and limitations must be prespecified. Biological variables being tested as predictors must remain analytically distinct from that criterion. [211]

The same rule applies to L2. Narrator-level ownership, memory-based interpretation, recursive access, command following, and report are downstream variables that may themselves be experimentally important. They do not need to be collapsed into a single formal function in Section 17, and they should not be used as hidden definitions of primary phenomenology. Their value lies precisely in permitting dissociations between primary phenomenal organization and later access or expression. [30, 31, 62, 64, 191–194, 208]

The resulting architecture can therefore be summarized without introducing a competing quantitative model:

$$\text{independently characterized state} \rightarrow \text{prespecified biological measurement model} \rightarrow \text{prospective correspondence test}$$

This arrow sequence represents the order of empirical testing, not a causal claim that the state produces the measurement model. Development data may be used to construct or calibrate a candidate model, but its definitions, transformations, comparisons, thresholds, and success criteria must be frozen before confirmatory holdout testing. [211]

A successful first-generation operationalization would show that a constrained, prospectively declared biological measurement model distinguishes and tracks independently characterized state transitions, generalizes across appropriate holdouts, and

survives key dissociations. Where multidimensional integration is claimed, that integration must provide prespecified reproducible value beyond stronger simpler alternatives rather than receiving privilege merely because additional biological dimensions have been included. Such success would strengthen the empirical adequacy of the measurement architecture and progressively constrain the candidate biological event. [211]

Failure must be interpreted at the level actually tested. Failure of one observed measure does not equal failure of the complete biological event hypothesis. Failure of one added component does not equal failure of an anchor. Failure of a state-specific model does not automatically equal failure of the proposed identity relation. Conversely, repeated failure cannot be indefinitely insulated by invoking unmeasured biology. Later sections therefore impose a hierarchical failure structure in which measurement, component, anchor, paired-architecture, and eventually broader Mapping failures are distinguished and recorded.

The first-generation formal contribution of Section 17 is thus intentionally limited. It establishes the ontology that quantitative models must respect, the independence requirements necessary to avoid circularity, the dissociations those models must survive, and the logic by which empirical success can progressively narrow alternative explanations. Section 18 supplies the actual quantitative operationalization. That division is deliberate: **Section 17 states what must be mapped and what would count as a legitimate test; Section 18 specifies how the current model attempts to perform that test.**

17.13 Empirical Derivation and Validation Logic

The Mapping Theorem becomes scientifically useful only if its proposed biological–phenomenological relation can be exposed to measurement, comparison, prediction, and failure. The role of the present subsection is therefore methodological rather than quantitative. It specifies the evidential sequence through which the theorem is to be constrained and tested. The detailed construction of observed variables, state-specific transformations, component scores, core and expanded models, thresholds, missing-data procedures, and quantitative validation belongs to Section 18.

A first distinction is essential. **Retrospective literature alignment, component-level empirical support, and prospective model validation are not the same evidential achievement.** Existing studies were not designed as one coordinated test of the Mapping Theorem. They frequently differ in population, task, state definition, measurement window, baseline, instrument, analytic method, and the subset of biological variables collected. Such studies can establish whether particular candidate dimensions are empirically plausible, whether relevant biological variables can be measured, and whether separate findings triangulate in directions compatible with the framework. They cannot, by retrospective aggregation alone, validate a prospectively declared full anchor model or the paired architecture. [211]

The evidential architecture must therefore distinguish at least three levels. **Literature alignment or triangulation** asks whether existing findings are broadly compatible with a proposed component or predicted dissociation. **Component-level support** asks whether a prespecified biological variable or construct behaves reproducibly in relation to an independently characterized state under suitable controls. **Prospective model validation** asks whether a frozen, prospectively declared model predicts or discriminates independent data that were not used to define, select, transform, weight, or calibrate that model. Only the third level constitutes validation of the model actually tested. [211]

This distinction also governs missing data. A study need not measure every candidate dimension to contribute useful evidence, but an unmeasured dimension is not confirming evidence. A dataset containing only part of the proposed measurement domain tests only the observed measures, components, or prospectively declared model that those measurements can validly instantiate. A deliberately prospectively declared core or restricted model is not a reduced model merely because it omits domains that were never required by that model. A **reduced implementation** arises when one or more dimensions required by an already-declared model are unavailable. Missing required variables must remain explicitly unavailable or nonevaluable unless a prespecified imputation procedure is scientifically justified. Reduced implementations must be identified explicitly, require appropriate calibration and validation, and must not be treated as automatically equivalent to the declared full model. Scores derived from different component sets must not be assumed to be directly comparable.

Empirical testing must begin with an independently specified target state. The experimental manipulation, eligibility criteria, phenomenal or state-identification criterion, biological predictor set, downstream access/report variables, and relevant covariates must be distinguished before confirmatory analysis. This requirement is especially important where self-report, behaviour, task structure, or clinical classification contributes to identifying the state. Such variables may be scientifically necessary for target-state characterization, but they cannot simultaneously be hidden inside the biological predictor and then counted as independent evidence that the predictor recovered the state. [211]

The same separation applies to the framework's major architectural levels. **Primary phenomenology** is the phenomenal target. The **complete bounded organism-relative biological event** is the proposed identity counterpart. The **Friction Signature** is an operational measurement representation providing empirical access to selected dimensions of that event. **L2 access, ownership, memory, command following, and report** are downstream variables that may help characterize dissociations but are not substitutes for primary phenomenology. Empirical validation must preserve these distinctions rather than allowing one level to define another by construction. [30, 31, 62, 64, 191–194, 208]

The candidate Friction Signature domain likewise requires construct discipline. The present framework proposes a shared multidimensional operational domain, but its dimensions are not six independently established causal mechanisms and are not automatically interchangeable across methods. Acute autonomic or regulatory organization must remain distinct from cumulative allostatic load. BOLD signal, cerebral blood flow, glucose utilization, oxygen metabolism, ATP-related estimates, and other energetic or hemodynamic measures must retain their different physiological meanings. Functional connectivity, effective

connectivity, topology, recurrence, and other network measures must be operationalized according to the method actually used. Neural or signal complexity must remain distinct from thermodynamic entropy production. Temporal persistence as a measured biological feature must remain distinct from the full time-ordered trajectory of the multivariate state and from the duration of report or behavioural expression. [35, 42, 44, 112, 118, 120, 121]

These distinctions matter because mathematical standardization cannot manufacture biological equivalence. Placing heterogeneous measures onto common numerical ranges may be useful within a defined analysis, but normalization alone does not establish commensurability, equal reliability, shared biological meaning, common metric geometry, or equal evidential weight. Network reorganization, signal complexity, autonomic change, metabolic observations, and temporal persistence may require different state-specific construction and transformation rules. For that reason, the theorem-level method does not prescribe one universal normalization formula, one universal directional difference, or one generic additive score. Those are model choices to be evaluated in Section 18 rather than consequences of the Mapping identity proposition. [35, 42, 44, 112, 118, 120, 121]

The empirical programme should proceed through a controlled sequence. During **development**, candidate measures, construction rules, transformations, model families, comparison conditions, and provisional decision rules may be explored using designated development data. During **calibration**, thresholds or other parameters may be estimated using data reserved for that purpose where feasible. Before confirmatory testing, the relevant analytic architecture must then be frozen: inclusion and exclusion rules, preprocessing, artifact handling, feature construction, baselines, transformations, model family, component inclusion, weights where applicable, comparison models, temporal windows, decision metrics, thresholds, and success or failure criteria. The resulting model is then tested unchanged on independent holdout data. [211]

The order of validation also matters. The first requirement is **same-target independent validation**: the same prespecified state construct should be tested in independent participants or data under sufficiently comparable operational criteria. Cross-task replication then asks whether the model survives a different implementation of the same target. Cross-population generalization asks whether it transports across relevant populations. Cross-state transfer and boundary testing ask whether it behaves correctly when confronted with related but non-equivalent states. A rumination model tested on worry or generalized anxiety, for example, is not automatically undergoing same-target validation; it may instead be undergoing a transfer or boundary test. These evidential questions must not be collapsed. [211]

Dissociations are especially important because they reduce explanatory freedom more strongly than simple positive correlation. A useful Mapping model should be able to distinguish states that share superficial features while differing in theoretically important organization. Focused practical attention provides a direct challenge to models that confuse sustained cognition or task effort with perseverative self-reference. Motor disconnection challenges models that equate behavioural output with phenomenology. Agent-specific anesthesia and disconnected-consciousness cases challenge models that equate unresponsiveness with absent phenomenology or assume one universal complexity direction. Meditation and psychedelic conditions challenge models that equate reduced self-reference with diminished primary phenomenology. These comparisons are not exceptions to be explained away after failure; they are prospective constraints against which the architecture should be tested. [12, 13, 21, 36–40, 45, 59, 73–75, 119, 149, 166, 167]

Retrospective evidence synthesis should remain transparent but should not masquerade as prospective model performance. For literature review and component-level assessment, findings may be classified as **supported, partially supported, mixed, unsupported, or unresolved**, provided those terms are explicitly treated as empirical-alignment categories rather than as classifier metrics or quantitative probabilities of the theorem being correct. *Supported* indicates that relevant evidence repeatedly aligns with the prespecified component-level expectation under appropriate conditions. *Partially supported* indicates that some relevant findings align while important portions remain unavailable or weak. *Mixed* indicates substantive disagreement across studies, methods, populations, or operationalizations. *Unsupported* indicates that available appropriately designed evidence repeatedly fails to match the prediction. *Unresolved* indicates that the relevant question has not yet been tested adequately.

These categories must retain their distinct epistemic meanings. Missing evidence is not the same as mixed evidence, and mixed evidence is not automatically a measurement problem waiting to be repaired. Persistent, well-controlled contradiction may reveal that a predicted direction is wrong, that a component is invalid, that the proposed decomposition is inadequate, or that the state itself is biologically more heterogeneous than the model assumes. Such findings must be permitted to weaken, remove, divide, or replace a component in a newly specified model. They cannot be converted into support merely by redescribing the failed result.

The same anti-rescue principle applies to model revision. Once a confirmatory model is locked, a failed prediction remains a failure of that model. New covariates, state definitions, contextual modifiers, component meanings, transformations, weights, thresholds, or explanatory mechanisms discovered after the result may motivate a revised model, but the revision constitutes **new model generation** and requires new independent validation. The correct sequence is therefore: [211]

$$\text{locked model} \rightarrow \text{independent test} \rightarrow \text{result} \rightarrow \text{failure or partial support} \rightarrow \text{documented new model} \rightarrow \text{new independent validation}$$

This rule is central to the theorem's falsifiability. It prevents flexibility in biological measurement from becoming permanent immunity from negative evidence.

Model comparison must also challenge the need for multidimensional complexity wherever multidimensional integration is claimed. A multidimensional Friction Signature model should not be preferred merely because it is richer or more theoretically appealing. It must be compared with the strongest valid simpler alternatives available for the state being tested: a single established marker, the strongest isolated component, a prospectively declared core or restricted model, behavioural or

report-only models where relevant, and shortcut predictors such as drug concentration, generic arousal, task demand, or negative affect when those alternatives could explain the same observation. A reduced implementation created by unavailable required measurements is not automatically interchangeable with an intentionally specified simpler model and requires its own calibration and validation. If a valid simpler comparator performs as well or better under independent validation, the added multidimensional structure has not earned its explanatory or predictive role. [211]

Accordingly, success must be interpreted at the evidential level actually tested. Accurate discrimination of independently characterized states can support measurement validity, biological state separation, trajectory correspondence, and incremental predictive value. Reversible perturbation can strengthen claims of biological dependence. Generalization across tasks, populations, and boundary cases can further constrain the candidate architecture. None of these achievements, taken alone, constitutes proof that primary phenomenology is strictly identical with the complete bounded biological event. The identity proposition becomes stronger only as multiple independent constraints progressively eliminate weaker alternatives.

Failure must be interpreted with equal discipline. Failure of one observed measure is not automatically failure of the complete biological event hypothesis. Failure of an optional component is not automatically failure of an anchor. Conversely, repeated failures cannot be dismissed indefinitely because the measurement representation is incomplete. The following subsection therefore formalizes the hierarchy of weakening and falsification conditions at the theorem level, while Section 18 specifies how corresponding model-level failures are implemented quantitatively.

The present scientific status is thus precise. Existing heterogeneous literature can provide empirical alignment, component-level support, and evidence of operational feasibility. The Mapping programme becomes quantitatively validated only when prespecified biological models are frozen and tested prospectively against independently characterized states, appropriate simpler alternatives, relevant dissociations, and independent holdouts. The contribution of the present subsection is to make that progression explicit and to ensure that both positive and negative evidence narrow the theory rather than merely decorate it. [211]

In this sense, the Mapping Theorem is operationally testable and vulnerable to empirical failure. Its empirical strength will depend not on how many measurements can be made to fit the framework retrospectively, but on how much explanatory freedom remains after the model has been specified in advance and exposed to independent tests.

17.14 Falsification and Weakening Conditions

A Mapping Theorem is scientifically useful only to the extent that its claims can be placed at risk. The present framework therefore requires explicit weakening and failure conditions and rejects retrospective reinterpretation as a substitute for prediction. Once a model, comparison, state criterion, measurement rule, or decision threshold has been fixed for confirmatory testing, an incompatible result remains a failure of that locked formulation. A later revision may be scientifically justified, but it constitutes a new model and requires new independent validation. [211]

The falsification logic must distinguish the **ontological identity proposition** from the **measurement models used to test it**. The proposed identity relation concerns primary phenomenology and the complete bounded organism-relative biological event. Friction Signatures provide selected, instrument-dependent access to dimensions of that event. Failure of one Friction Signature measure or one state-specific operational model therefore does not automatically demonstrate that the complete biological event is unrelated to phenomenology. Conversely, this distinction cannot become permanent immunity from negative evidence. Repeated failure across increasingly complete, prespecified, independently tested models progressively weakens the empirical Mapping strategy and can ultimately require revision of the central proposition.

The identity proposition itself carries a stronger entailment. If two cases are independently characterized as genuinely different in primary phenomenology, then under the identity hypothesis their complete bounded biological events cannot be identical in every identity-relevant respect. Conversely, if future methods were able to establish that identity-relevant biological organization was genuinely the same while primary phenomenology differed, the identity proposition would be directly challenged. Present Friction Signature models do not yet exhaust the complete event, so operational failure must be interpreted at the level actually tested rather than elevated prematurely into an ontological conclusion.

The publication-facing failure hierarchy is therefore:

1. **Observed-measure failure.** A prespecified measurement fails to behave as predicted under adequate measurement and control. This weakens that measure as an indicator of the intended construct.
2. **Expanded-component failure.** A noncore component adds no reproducible information, fails construct validity, or behaves contrary to its locked prediction. The component should be removed, divided, or revised in a new model rather than protected because it remains biologically interesting.
3. **Anchor-core failure.** The prespecified core architecture for a state repeatedly fails to distinguish or track the independently characterized target under appropriate holdout testing. This substantially weakens that anchor model.
4. **Complete-anchor failure.** Here *complete anchor* means the prospectively declared full anchor model, not the complete bounded biological event. Repeated failure of that full anchor model across independent, well-designed studies indicates that the present Friction Signature operationalization has not produced a viable quantitative model for that state.
5. **Paired-architecture failure.** The paired architecture fails when the individual anchor models cannot be integrated under stable shared constructs and common validation rules. Cross-anchor invariance applies only to domains prospectively retained in both relevant anchor models under the same frozen theoretical meaning. The individual anchors may therefore

each show adequate local performance while the paired architecture fails because shared construct meaning does not survive across them.

6. **General Mapping-strategy failure.** Repeated strong prospective failure across independently characterized states, appropriate perturbations, boundary cases, and increasingly complete locked models would require major revision of the central empirical strategy. At this level, appeal to unspecified missing variables cannot function as an unrestricted rescue clause.

This hierarchy prevents two opposite errors. It prevents a noisy measure from being mistaken for a decisive refutation of the entire theory, while also preventing the incompleteness of present measurement from being used to absorb every negative result. Before data are examined, each study must state which level it is capable of testing: an observed measure, an expanded component, an anchor core, a prospectively declared full anchor model, the paired architecture, or a broader Mapping strategy.

Several classes of result are particularly important because they reduce explanatory freedom rather than merely supplying positive correlations.

First, independently characterized states should show reproducible biological separation when the locked model predicts such separation. A meaningful test must demonstrate separation beyond expected within-state variation, measurement error, relevant confounds, and the performance of simpler alternatives. If focused practical attention and sustained perseverative self-reference repeatedly remain indistinguishable under the prespecified biological model, for example, the upper-anchor architecture is weakened. The same logic applies to other contrasts specified in Section 17.11. [12, 13, 21, 33–35, 68, 119, 211]

Second, the theory must survive dissociations between primary phenomenology, recursive access, report, and behaviour. Motor disconnection must not be classified as phenomenal absence merely because ordinary behavioural output is unavailable. Likewise, reduction of self-referential narration in a specified meditation condition must not be treated as equivalent to the biological disruption produced by a specified anesthetic condition merely because both reduce ordinary self-related report. Such contrasts are valuable only when the phenomenal or state criterion is independently specified enough that the biological predictors are not also being used to define the outcome. [31, 36–40, 43, 59, 73–75, 149, 160, 161, 181–186, 211]

Third, perturbational predictions must be vulnerable to failure. For the lower constraint, a manipulation that achieves prespecified target engagement in biological organization hypothesized to be relevant to primary phenomenology should produce the predicted state-specific change if that organization is genuinely important. A null result is informative only when target engagement, timing, endpoint homology, and measurement adequacy are demonstrated. Recovery need not be simultaneous across network, complexity, autonomic, cognitive, mnemonic, behavioural, and report variables; the prediction is structured temporal correspondence and dissociation, not one universal restoration time. [38–40, 50, 53–55, 74, 75]

For the upper constraint, the target must be independently characterized as sustained perseverative or self-referential processing before the biological predictor is tested. The falsifier cannot be stated circularly as "recursive load changes but the Friction Signature does not," because recursive load may itself be one of the operational dimensions. Instead, the framework predicts that an independently identified sustained recursive state should be accompanied by the prespecified state-specific biological measurement trajectory and should be distinguishable from matched focused practical attention, generic negative affect, ordinary mind-wandering, and other relevant controls. Repeated failure under adequate measurement weakens the upper-anchor model. [12, 13, 21, 119, 211]

Fourth, multidimensional complexity must earn its place wherever multidimensional integration is claimed. A prospectively declared unidimensional core is not required to outperform itself as an individual component; it must instead be challenged against the relevant shortcut or non-biological comparators. For a multidimensional core, expanded model, or prospectively declared full model, a valid simpler comparator that performs as well or better under independent validation shows that the added multidimensional structure has not demonstrated incremental predictive value. A reduced implementation arising because required measurements are unavailable is a distinct implementation and must not be silently substituted for an intentionally declared core or restricted model. None of these results, by itself, falsifies the deeper identity proposition. [211]

Fifth, predictions of reorganization, redistribution, preservation, or uncoupling must identify the relevant relation before testing. A prediction cannot survive merely by relabelling any unexpected direction as "reorganization." The network relation, pattern, coupling, state occupancy, or other structure expected to change must be prespecified, along with what result would count as failure.

Sixth, prospective prediction must eventually replace retrospective accommodation. Same-target independent validation, cross-task replication, cross-population transport, and novel-state or boundary extrapolation are different tests and should be reported separately. A model that explains only the data from which it was constructed has not demonstrated predictive generalization. [211]

The anti-rescue rule governing all of these cases is:

$$\text{locked model} \rightarrow \text{independent test} \rightarrow \text{result} \rightarrow \text{failure or partial support} \rightarrow \text{documented new model} \rightarrow \text{new independent validation}$$

New covariates, baselines, component definitions, signs, transformations, thresholds, contextual modifiers, or mechanistic explanations introduced after a failed confirmatory result may motivate a new model. They do not erase the failure of the version that was actually tested. The scientific value of the Mapping programme depends upon becoming more constrained as evidence accumulates, not more flexible. [211]

The strongest present conclusion is therefore not that every future failure has already been reduced to one decisive experiment. It is that the framework specifies a hierarchy through which negative evidence can accumulate without either premature ontological overreach or indefinite theoretical rescue. The Mapping relation remains scientifically exposed because its operational models, cross-anchor architecture, dissociation predictions, and ultimately its general strategy can all fail.

17.15 Scope, Present Status, and Future Development

The Mapping Theorem is presently a **falsifiable biological mapping architecture with initial dual-anchor quantitative operationalization and a defined path toward prospective validation**. It is not a completed quantitative identity proof, a universal consciousness meter, or a direct third-person measurement of primary phenomenology. Strict identity remains the strongest theoretical proposition of the framework, but it has not yet been demonstrated by the empirical programme described here.

The current scope is deliberately restricted to living organisms and to the class of complete bounded organism-relative biological events defined earlier in this section. That restriction is methodological and theoretical: it identifies the domain for which the present biological architecture has been developed. It is not a proof that nonliving or artificial systems cannot possess phenomenology. Any extension beyond living systems would require an independently justified account of which organizational relations are genuinely equivalent to those used by the present theorem rather than an inference from behavioural or linguistic similarity alone.

Within this framework, the explanatory gap is reformulated as a constrained biological–phenomenological mapping problem. Primary phenomenology is specified independently as the organism-relative phenomenal target. The complete bounded organism-relative biological event is specified independently as the candidate mapped physical unit. The Mapping Theorem proposes that these are not two separate occurrences joined by a later conversion, but two characterizations of one event. The narrator, self-model, autobiographical ownership, and report are downstream recursive organizations and therefore are not the primitive target that the theorem is attempting to map.

The present architecture has now specified the major theoretical and empirical commitments required to make that proposition testable. It defines the candidate biological event and its current scope; distinguishes primary phenomenology from L2 ownership and report; proposes the Stochastic Pump as a systems-level support architecture rather than a phenomenology-generating entity; treats Friction Signatures as operational measurement representations rather than as the event itself; introduces reversible suppression and sustained recursive load as complementary perturbational constraints; generates cross-state and boundary-case predictions; and defines an empirical path through prespecified measurement, prospective comparison, independent validation, model competition, and explicit failure.

The Friction Signature domain remains provisional. Its dimensions are proposed theoretical and operational constructs, not six independently established causal mechanisms and not an exhaustive decomposition of the biological event. Acute autonomic or regulatory organization must remain distinct from cumulative allostatic load. Neural or signal complexity must remain distinct from thermodynamic entropy production. Functional connectivity, effective connectivity, BOLD, cerebral blood flow, glucose metabolism, oxygen metabolism, electrophysiological complexity, autonomic measures, and temporal variables retain their method-specific meanings. Section 18 provides the quantitative rules by which observed measures are constructed into state-specific components, transformed, compared, and tested. [35, 42, 44, 112, 118, 120, 121]

The lower and upper constraints likewise have limited but important roles. Reversible suppression is a perturbational and dependence constraint, not a proof that behavioural unresponsiveness equals phenomenal absence. Sustained recursive or perseverative processing is an upper comparative constraint, not an upper bound on consciousness and not a claim that more biological cost means more phenomenology. Their value lies in whether the same methodological architecture and invariant-domain discipline can survive fundamentally different manipulations while preserving the predicted dissociations among phenomenology, access, report, behaviour, and biological organization. The anchor-specific models need not contain identical component sets or dimensionality; direct cross-anchor invariance claims apply only to domains prospectively retained in both relevant anchors under the same frozen theoretical meaning. [12, 13, 21, 38–40, 74, 75, 119]

Existing heterogeneous literature can provide component-level support, empirical alignment, boundary constraints, and evidence that the proposed measurements are operationally feasible. It cannot by itself validate either prospectively declared full anchor model or the paired architecture because the relevant studies were not designed as one harmonized prospective test. The quantitative programme therefore remains prospective. Development and calibration data may be used to construct candidate models, but confirmatory testing requires frozen variables, preprocessing, transformations, comparisons, thresholds, decision rules, component membership, and success criteria evaluated on independent data. [35, 38–40, 42, 44, 74, 75, 112, 118–121, 211]

The present status should also be kept distinct from the long-term identity objective. Successful state separation, trajectory correspondence, dissociation survival, and predictive generalization would strengthen the empirical adequacy of the Mapping architecture and progressively restrict the biological organizations compatible with the data. Stronger evidence would come from temporally lawful perturbation, externally replicated prediction, cross-condition invariance, targeted intervention with demonstrated target engagement, and eventually necessity or sufficiency constraints where scientifically tractable. None of these steps should be treated as a semantic shortcut from correlation to identity.

The intended progression is therefore cumulative:

This sequence expresses an evidential programme, not a guarantee that every stage will succeed. Its purpose is to reduce explanatory freedom. Each successful constraint eliminates biological descriptions that cannot support the observed correspondence; each failed constraint narrows, revises, or rejects the model at the appropriate level. Identity would be warranted only to the extent that competing descriptions lose explanatory viability under progressively stronger independent tests.

Future development should therefore proceed through the quantitative architecture of Section 18 rather than by reviving superseded first-generation equations. The immediate tasks are to complete empirical alignment at the component level, lock the operational definitions of the two anchors, test same-target holdouts, establish or reject cross-anchor construct invariance for domains prospectively retained as shared, compare any model claiming multidimensional integration with its strongest valid simpler alternatives, and subject the retained architecture to prospective perturbational and boundary-case tests. Only models that survive those stages should be extended toward stronger causal, intervention, or identity-level claims.

Historical predictive equations, cross-species scaling constants, suppression factors, recursive-overhead parameters, universal energetic thresholds, and related quantities from earlier exploratory versions are not part of the present publication-facing Mapping Theorem. Any future reintroduction would require fresh biological definitions, units and dimensional analysis, primary-source verification, endpoint-homology review, independent derivation, non-circularity analysis, and a prospective validation design. They cannot be restored merely because they once produced an apparently suggestive numerical fit.

Boundary cases remain part of the core research programme rather than optional illustrations. Disconnected or dreamlike experience under anesthesia, covert awareness, motor disconnection, altered self-reference, meditation subtypes, psychedelic states, natural sleep, and related conditions can expose where phenomenology, access, report, behaviour, and candidate biological organization come apart. The framework is strengthened only if its definitions remain stable across such cases; a special definition invented for each difficult condition would defeat the purpose of a Mapping Theorem. [31, 36–40, 43, 45, 51–54, 59, 73–75, 149, 160, 161, 166, 167, 181–186]

The contribution of Section 17 is therefore theoretical but empirically vulnerable. It has not directly measured primary phenomenology or prospectively validated strict identity. It has instead specified what is to be mapped, separated the target from the narrator that later claims it, identified a candidate event-level biological counterpart, defined an operational measurement interface, introduced complementary perturbational constraints and dissociation tests, and stated how failures must count. This makes the proposed biological–phenomenological relation progressively constrainable rather than leaving identity as an unconstrained assertion.

The next section supplies the quantitative operationalization required to test that architecture. Its task is not to redefine the ontology established here, but to determine whether the proposed measurement domains can be constructed, frozen, compared, generalized, and falsified under independent empirical conditions. The Mapping Theorem will become stronger only to the extent that this reduction of explanatory freedom survives those tests.

18.0 Purpose, Scope, and Present Status

18.1 Dual-Anchor Quantitative Operationalization

Section 17 established the conceptual architecture of the Mapping Theorem: a proposed and falsifiable identity relation between independently characterized primary phenomenology and the complete bounded organism-relative biological event, with narrator-level recognition, ownership, memory-based interpretation, and report treated as downstream processes rather than as the primitive phenomenological target. It also established that Friction Signatures are operational measurement representations rather than the complete biological event, and that the Stochastic Pump is the framework's proposed systems-level support architecture rather than an established mechanism that generates phenomenology. Section 18 takes the next scientific step by asking how that architecture can be translated into constrained, state-specific quantitative models without collapsing the distinctions on which the Mapping proposition depends.

Two mappings must therefore remain explicit. At the ontological level, the Mapping Theorem proposes:

$$B_{event} \leftrightarrow P_{primary}$$

where B_{event} denotes the complete bounded organism-relative biological event and $P_{primary}$ denotes independently specified primary phenomenology. This relation is the proposed identity/correspondence of two characterizations of one occurrence; it is not a fitted empirical equation and has not been prospectively validated. At the measurement level, Section 18 addresses a different relation:

$$X^{(s)} \rightarrow \phi^{(s)} \rightarrow M^{(s)}$$

where $X^{(s)}$ denotes selected biological observations under state or anchor s, $\phi^{(s)}$ denotes their prespecified construction and state-specific transformation into an operational representation, and $M^{(s)}$ denotes the candidate measurement model evaluated prospectively. The measurement mapping provides incomplete third-person access to the biological side of the identity proposition. It does not calculate phenomenology, convert a Friction Signature into experience, or establish that a successful state classifier is an identity equation.

The first quantitative implementation uses two complementary perturbational anchors: a reversible anesthesia-suppression anchor and a sustained rumination or perseverative-recursion anchor. The terms *lower* and *upper* may be retained as shorthand for their different perturbational roles, but they do not identify lower and higher amounts of consciousness. Anesthesia and rumination are not opposite endpoints on a single phenomenological scale. They are biologically and psychologically distinct conditions used to challenge the same Mapping architecture under markedly different forms of state change.

The anesthesia anchor tests reversible suppressive disruption and reorganization. Controlled anesthetic paradigms allow biological organization to be followed across wakefulness, induction, suppression, emergence, and recovery, while agent-specific dissociations prevent behavioural unresponsiveness from being treated as equivalent to phenomenal absence. The relevant prediction is not that every candidate variable must decrease. Network organization, neural or signal complexity, metabolic and regulatory measures, temporal structure, and downstream access-related variables may change in different directions and at different rates depending upon agent, depth, endpoint, and measurement method. Section 18 therefore requires later anesthesia predictions to be specified at the level of the retained component, anesthetic regime, comparison state, measurement method, time window, and expected configuration before confirmatory data are inspected. [38–40, 50, 55, 60, 74, 75]

The rumination anchor tests a substantially different form of organization: sustained, difficult-to-disengage perseverative or self-referential cognition. Empirical literature supports rumination and related perseverative cognition as temporally persistent, frequently self-referential, and associated with measurable neural and physiological changes, but it does not establish one universal direction across network, metabolic, autonomic, or dynamical measures. Within the present framework, rumination is interpreted as a condition in which recursive representation can remain biologically consequential after the initiating external event is no longer present. That L2 interpretation is a framework-level proposal rather than a directly measured neuroscientific entity. The quantitative task is therefore to determine whether an independently characterized ruminative state is accompanied by a prespecified biological measurement trajectory that can be distinguished from calm wakefulness, ordinary mind-wandering, generic negative affect, structured distraction, and, especially, focused practical attention. [12, 13, 21, 119]

Focused practical attention is a critical comparator because sustained cognition, task demand, or attentional effort must not be mistaken for perseverative self-reference merely because they recruit substantial neural processing. A successful upper-anchor model must therefore separate recursive persistence from generic cognitive effort without assuming unsupported universal increases in metabolism, autonomic activity, network activation, or dynamical constraint. Direct energetic or metabolic claims must remain tied to measurement methods that actually index those quantities. [33–35, 68]

The scientific value of the dual-anchor design lies in constraint rather than numerical symmetry. The same operational architecture must survive both reversible suppressive disruption and sustained recursive persistence without changing the theoretical meaning of its central constructs after the results are known. Shared Friction Signature labels alone are insufficient. Cross-anchor validity requires that each retained construct preserve an invariant theoretical meaning while allowing prespecified state-specific manifestations. If both anchor models can be made to work only by changing what a shared variable means between anesthesia and rumination, the paired architecture has failed even if each condition can be modelled separately.

The dual-anchor design also preserves the distinction between primary phenomenology and downstream access. Under anesthesia, behavioural responsiveness, command following, memory encoding or retrieval, later recall, and explicit report provide different kinds of evidence and must not be collapsed into a single L2 variable. Their absence does not independently establish absence of primary phenomenology. Under rumination, self-referential report and state-rumination measures may contribute to an independently specified state criterion, but they cannot then be reused without qualification as biological predictors of the same state. The methodological order remains: [39, 40, 74, 75, 211]

$$\text{independent state criterion} \rightarrow \text{state classification} \rightarrow \text{prespecified biological prediction} \rightarrow \text{independent test}$$

Where scalar state-specific summaries are useful, later subsections may denote them as:

$$S_{ana}(t)$$

and:

$$S_{rum}(t)$$

for the anesthesia-suppression and sustained-recursion models respectively. These are candidate model-space summaries, not coordinates of the complete biological event and not measures of "less consciousness" and "more consciousness." They must not be added or interpreted as interchangeable quantities. A trajectory-based representation retains priority whenever a scalar summary would obscure reorganization, component interaction, or asynchronous transition and recovery.

Each anchor is therefore developed through nested candidate models. A core model contains the dimensions with the strongest current empirical relevance and measurement maturity for the target state. An expanded model may add other prespecified dimensions where the evidence justifies testing them. The expanded model is not assumed to be biologically complete and is not preferred merely because it is more elaborate. It earns retention only if it provides prespecified incremental out-of-sample value beyond the core model and the strongest simpler comparator under untouched validation data. Interpretability may assist scientific explanation, but it cannot rescue a model that fails its primary confirmatory criterion.

The same principle now applies directly to the Stochastic Pump. Section 17 defines the Pump as the proposed systems-level organization of established biological work supporting readiness, event-specific recruitment, controlled perturbation, coordination, containment or transformation, and restoration or reorganization of future functional availability. Section 18 does not assume that this systems-level construct is justified merely because its component processes exist. It must distinguish component-level predictions from Pump-level coordination predictions and compare a component-only model with a Pump-coordination model using the same underlying biological information. The Pump model may add prespecified cross-component relations, temporal or phase ordering, and recovery or disengagement structure, but the added complexity must be penalized. If those coordination terms fail to provide reproducible incremental performance on independent data, the individual biological components may remain valid while the Stochastic Pump is weakened as a distinct systems-level explanatory construct.

The stronger Pump test is cross-anchor. Readiness, controlled recruitment or perturbation, coordinated transformation or persistence, containment or resolution, and restored or reorganized availability must retain the same theoretical meaning across anesthesia suppression and emergence and rumination persistence and disengagement. State-specific implementations may differ; the coordination principle itself cannot be rewritten after either result. This requirement makes the Pump empirically vulnerable without turning Section 18 into a separate theory of the Pump.

The quantitative models developed in Section 18 are first-generation operational hypotheses. Their component definitions, construction functions, transformations, weights, thresholds, time windows, comparison conditions, preprocessing rules, and success criteria may be developed and calibrated using designated development data, but the confirmatory model must be frozen before independent testing. Validation must distinguish development or calibration, manipulation holdout, participant holdout, and, where available, external replication or transportability. A failed locked model remains a failed model. Post hoc changes may motivate a new model generation, but they do not retroactively rescue the original test. [211]

The purpose of this quantitative programme is therefore narrower and more demanding than assigning a number to consciousness. It does not attempt to derive a universal equation for all conscious states, quantify the total amount of phenomenology, infer exact qualitative content from a single biological measure, equate metabolism, network integration, neural complexity, autonomic activity, or any other isolated variable with phenomenology, or establish strict biological identity from state classification alone. Nor does it assume that the current six Friction Signature dimensions are exhaustive or that multidimensionality has already defeated simpler models. The present dimensional architecture is a proposed operational decomposition whose value must be earned through construct validity, cross-condition invariance, prospective prediction, simpler-model comparison, dissociation survival, and independent validation.

The programme is correspondingly vulnerable to failure. A state-specific anchor is weakened when a frozen model fails to distinguish or track the independently characterized target state under adequate measurement. Any retained model claiming multidimensional integration is weakened when a stronger simpler model performs as well or better. The Pump is weakened when its coordination terms add no independent value. The paired architecture is weakened when shared constructs fail cross-anchor invariance. Repeated failure cannot be indefinitely insulated by appealing to unspecified unmeasured biology; revised variables, transforms, thresholds, or construct meanings create a new model that requires new independent validation. [211]

At the present stage, existing literature provides component-level empirical alignment, boundary cases, and evidence that the proposed measurements and perturbational designs are feasible. It does not constitute completed validation of either anchor, the paired architecture, the Pump coordination advantage, complete-event necessity or sufficiency, or strict phenomenology–biology identity. The strongest justified description of the current programme is therefore **a falsifiable biological mapping architecture with initial dual-anchor quantitative operationalization and a defined path toward prospective validation**. [12, 13, 21, 35, 38–40, 42, 44, 55, 112, 118–121, 211]

The following subsection defines the shared Friction Signature measurement domain and the quantitative method through which the anesthesia and rumination anchors are constructed and tested.

18.2 Shared Friction Signature Measurement Domain and Quantitative Method

The two anchors introduced in Section 18.1 are operationalized within a shared Friction Signature measurement architecture. The Friction Signature does not constitute the complete bounded organism-relative biological event and is not a measurement of primary phenomenology. It is a selected, explicitly incomplete operational representation through which third-person observations can constrain biological dimensions of the candidate event. The current first-generation shared operational domain is:

$$FS(t) = [R(t), A(t), M(t), N(t), C(t), T(t)]$$

where R denotes biological organization associated with recursive or access-related processing; A autonomic and regulatory organization; M metabolic and energetic organization; N organization of interactions among distributed neural systems; C neural or signal complexity, diversity, and dynamical organization; and T a prespecified within-window temporal feature of the candidate state. These six dimensions constitute the present operational decomposition. They are not asserted to be exhaustive, mutually independent natural kinds, six established causal mechanisms, or theorem-level necessities. Their scientific status depends upon construct validity, incremental predictive value, and prospective performance against simpler alternatives.

Several distinctions follow immediately. Acute autonomic and regulatory measurements are not equivalent to cumulative allostatic load. Functional connectivity, effective connectivity, network topology, integration, and dynamic connectivity are related but non-interchangeable measurement families. Perturbational Complexity Index, Lempel-Ziv complexity, permutation entropy, signal diversity, and other dynamical measures likewise estimate different properties and are not thermodynamic entropy production. Thermodynamic entropy production, where investigated, requires its own physical boundaries and modelling assumptions and must not be folded into C merely because both use the word *entropy*. Finally, $T(t)$ denotes a prespecified temporal feature estimated within a defined measurement window; it is not the full trajectory of the multivariate state through time. [38, 39, 54, 112, 118, 120, 121]

The same shared measurement domain is used to organize the anesthesia and rumination models, but a shared label is not sufficient to establish a shared construct. Let:

$$s \in \{ana, rum\}$$

denote the anesthesia and rumination anchors. For this shared domain, the state-specific full-domain template may be written:

$$FS^{(s)}(t) = [R^{(s)}(t), A^{(s)}(t), M^{(s)}(t), N^{(s)}(t), C^{(s)}(t), T^{(s)}(t)]$$

The superscript identifies the state-specific manifestation and measurement rule; it does not license the theoretical meaning of a dimension to change after the result is known. Cross-anchor construct invariance therefore requires, for each dimension retained in a given anchor-specific model, a prespecified invariant theoretical meaning, allowed state-specific manifestations, prohibited meaning changes, eligible measurement families, and a criterion by which cross-state construct continuity can fail. If a dimension can be made to fit anesthesia and rumination only by changing what it means between the two conditions, the paired architecture has failed at the construct-invariance level even if separate condition-specific models remain useful.

This requirement is especially important for R, C, and T. Recursive/access-related biology may be expressed under anesthesia through changes in biological processes supporting recursive availability, while under rumination it may be expressed through sustained recruitment of biological processes associated with perseverative self-reference. Those are not automatically the same latent variable. The invariant claim must be defined at a sufficiently stable biological level before testing. Likewise, neural complexity under anesthesia and dynamical persistence or inflexibility during rumination cannot be grouped merely by using one broad label. If a scientifically coherent common construct cannot be established, the correct response is to revise, divide, or remove the disputed dimension in a new model generation rather than preserve nominal invariance.

Observed Measures and Constructed Dimensions

The Friction Signature dimensions are operational constructs and need not correspond one-to-one with individual instruments. Let:

$$\mathcal{D} = \{R, A, M, N, C, T\}$$

and let:

$$X_{ij}^{(s)}(t)$$

denote observed biological measure j associated with candidate dimension $i \in \mathcal{D}$ under anchor s. A state-specific constructed estimate may then be written:

$$X_i^{(s)}(t) = f_i^{(s)}\left[X_{i1}^{(s)}(t), X_{i2}^{(s)}(t), \ldots, X_{ik_i}^{(s)}(t)\right]$$

where $f_i^{(s)}$ is a prespecified construction procedure. The procedure may use one validated measure, a predefined composite, a latent-variable model, dimensionality reduction, a multivariate pattern, or another justified estimator. The critical requirement is that the construction procedure be specified according to its epistemic status. Unsupervised, externally validated, and supervised constructions are not equivalent. Any supervised feature selection, dimensionality reduction, prototype construction, classifier fitting, or target-derived transformation must occur entirely within designated development data and must be frozen before confirmatory evaluation. [211]

A classifier trained on the same target labels that the final biological model is later claimed to predict can otherwise embed the outcome inside the predictor. Section 18 therefore distinguishes state-identification variables from biological predictor variables. Report, questionnaire scores, behavioural response, command following, memory performance, and task performance may contribute to an independently specified state criterion where scientifically justified, but they cannot then be inserted unqualified into the biological Friction Signature predictor and counted again as independent biological evidence. In particular, R must be biologically operationalized if it is retained inside the biological model. L2, narrator-level ownership, and recursive access remain framework interpretations of distributed biological and cognitive processes rather than a directly observed single neuroscientific entity. [211]

Candidate measurement families also require method-specific validity. For A, heart rate, heart-rate variability, blood pressure, respiration, electrodermal measures, and endocrine measures do not become one construct merely because all bear on regulation. For M, PET glucose utilization, oxygen consumption, cerebral blood flow, BOLD signal, lactate, ATP-related estimates, and heat measurements differ in what they directly measure and what they only infer. BOLD or hemodynamic change cannot be treated as direct glucose utilization, oxygen consumption, ATP turnover, or total dissipative cost. For N, statistical functional connectivity is not equivalent to model-based effective connectivity. For C, perturbational and spontaneous signal-complexity measures require separate definitions and validation. A list of plausible instruments is therefore not evidence that the instruments estimate one interchangeable latent quantity. [12, 35, 38, 39, 42, 54, 112, 118, 120, 121]

Baselines and Organism-Relative Calibration

Every component must be interpreted relative to a prespecified reference appropriate to the scientific contrast. Let:

$$B_i^{(s)}$$

denote the baseline and calibration information for dimension i under anchor s. For anesthesia, an appropriately defined wakeful period will often provide the principal within-participant reference, supplemented where necessary by agent-, depth-, sleep-, sedation-, or recovery-specific comparisons. For rumination, calm rest alone is an insufficient universal comparator because spontaneous self-referential thought may occur during rest. Matched focused practical attention, structured distraction, negative affect without perseveration, or other prespecified non-ruminative controls may therefore be required. [36, 119, 201]

Within-person baseline, participant-specific calibration, population normative reference, and external calibration reference must remain distinct. Organism-relative modelling does not imply that every analysis must use only within-person values, but a population distribution cannot silently replace participant-specific calibration as though the two were equivalent. Where participant-specific normalization is used, all parameters must be estimated without access to that participant's confirmatory holdout observations. Baseline definitions, exclusion rules, preprocessing, and calibration procedures must be frozen before the relevant independent test. [211]

State-Specific Transformation

Raw biological measurements differ in units, variance, direction, temporal resolution, and construct meaning and cannot be directly summed or subtracted. Each retained dimension must therefore pass through a prespecified state-specific transformation:

$$\phi_i^{(s)}(t) = g_i^{(s)}\left[X_i^{(s)}(t), B_i^{(s)}\right]$$

where $\phi_i^{(s)}(t)$ is the transformed operational component score and $g_i^{(s)}$ defines how the observed or constructed biological measure is related to the prespecified state-specific prediction.

A bounded implementation may use:

$$\phi_i^{(s)}(t) \in [0, 1]$$

but this interval is a normalization and calibration convention only. It does not establish that the components share units, equal reliability, equal information content, equal causal status, or metric commensurability. One unit of transformed network organization is not thereby equivalent to one unit of transformed metabolic or autonomic organization. Any subsequent combination of these scores introduces additional model assumptions that must themselves be tested.

The transformation must encode a definite prediction rather than a retrospective menu of acceptable changes. For anesthesia, a component cannot count arbitrary suppression, preservation, reorganization, redistribution, or uncoupling as confirming outcomes. Before confirmatory testing, the relevant anesthetic agent or regime, component, measurement method, baseline, time window, expected pattern, and failure condition must be locked. The same rule applies to rumination: “reorganization” cannot mean any observed network or dynamical change. A specific relation must be defined prospectively.

Simple monotonic transformations are appropriate only when a scientifically justified monotonic relation has been specified. Where higher raw values indicate greater expression of the target profile, a positive directional transform may be used; where lower values indicate greater target expression, the direction may be inverted. For a baseline-standardized measure:

$$Z_i^{(s)}(t) = \frac{X_i^{(s)}(t) - \mu_i^{(s)}}{\sigma_i^{(s)}}$$

where $\mu_i^{(s)}$ and $\sigma_i^{(s)}$ are the prespecified development/calibration reference mean and standard deviation for this example, with $\sigma_i^{(s)} > 0$. A prespecified directional sign:

$$u_i^{(s)} \in \{-1, +1\}$$

may be applied before bounded calibration. A possible calibration form is:

$$\phi_i^{(s)}(t) = h_i^{(s)}\left[u_i^{(s)} Z_i^{(s)}(t)\right]$$

with:

$$h_i^{(s)} : \mathbb{R} \to (0, 1)$$

A logistic mapping is one possible statistical implementation:

$$h_i^{(s)}(z) = \frac{1}{1 + \exp\left[-a_i^{(s)}(z - b_i^{(s)})\right]}$$

where $a_i^{(s)}$ and $b_i^{(s)}$ are calibration parameters estimated only in development or calibration data. For a direction-preserving implementation of the prespecified sign convention above, $a_i^{(s)} > 0$; allowing the fitted slope to change sign would otherwise reverse the locked directional interpretation. This function is an optional statistical calibration device, not a biological law.

Many candidate measures are not adequately represented by a single monotonic direction. Network topology, dynamic connectivity, signal complexity, metabolic redistribution, regulatory organization, recurrence structure, and other multivariate patterns may instead require comparison with a prespecified reference configuration. Such a transform may be represented generically as:

$$\phi_i^{(s)}(t) = d_i^{(s)}\left[\mathbf{X}_i^{(s)}(t), \mathbf{B}_i^{(s)}\right]$$

where $d_i^{(s)}$ is an anchor- and method-specific function mapping a multivariate observation to a bounded measure of prespecified target resemblance or departure from a defined comparison state. The target configuration, prototype, classifier, distance function, or recurrence structure must be constructed only within development data and frozen before holdout testing. A profile discovered in confirmatory data cannot subsequently be presented as a prospectively predicted profile. [211]

Development, Calibration, and Holdout Separation

The quantitative pipeline must separate model development from confirmation. Its mature sequence is:

$$\text{development/calibration}$$
$$\rightarrow$$
$$\text{manipulation, agent, or task holdout}$$
$$\rightarrow$$
$$\text{participant holdout}$$
$$\rightarrow$$
$$\text{external replication or transportability}$$

Development data may be used to estimate measurement reliability, construct candidate dimensions, select among prespecified model families, calibrate transformations, estimate provisional weights, define target profiles, and establish decision thresholds. Once a confirmatory model is declared, the entire analysis pipeline must be frozen: inclusion and exclusion rules, preprocessing, artifact handling, masks or parcellations where applicable, feature definitions, construction procedures, transformations, baselines, covariates, model family, tuning procedure, weights, thresholds, time windows, comparison conditions, decision metrics, and success or failure criteria.

Manipulation, agent, or task holdouts test whether the model survives a new condition without semantic or analytical revision. Participant holdouts test person-level generalization and protect against fitting organism-specific idiosyncrasies. External replication or transportability tests a further question and should not be collapsed into internal robustness analysis. Sensitivity analyses can assess robustness of a successful or ambiguous locked result, but they cannot convert failure of the locked confirmatory model into success.

The same target observations must never be used simultaneously to discover the state profile, construct the predictor, tune its transformation, choose the weights, set the threshold, and demonstrate confirmation. Where supervised procedures are used anywhere in the pipeline, all feature and model selection must remain nested inside development data. These requirements apply equally to participant-specific calibration. [211]

Candidate Scalar Models

A scalar state-specific summary may be useful for some analyses, but it is a candidate model class rather than a consequence of the Mapping Theorem. One additive form is:

$$S_s(t) = \sum_{i=1}^{k_s} w_i^{(s)} \phi_i^{(s)}(t)$$

where $k_s \geq 1$ is the number of components prospectively retained in that scalar model. With, in one possible constrained implementation:

$$\sum_{i=1}^{k_s} w_i^{(s)} = 1$$

and:

$$w_i^{(s)} \geq 0$$

The weighted sum assumes additivity and compensability: a lower value in one component can be offset by a higher value in another. Non-negative weighting additionally assumes that, after transformation, every retained component contributes in the same model-score direction. Neither assumption is theorem-level. Both must be evaluated against alternative architectures where interactions, non-compensatory relations, nonlinear structure, or multivariate trajectories provide a better account.

A provisional equal-weight model may be used as a transparent engineering baseline:

$$w_i^{(s,0)} = \frac{1}{k_s}$$

but equal weighting does not imply equal causality, validity, reliability, independence, or biological importance. Data-derived weights must be estimated only within development data and frozen before holdout testing. The weighted model must also be challenged by the strongest single marker, the strongest isolated component, appropriate prospectively declared simpler or restricted models, and other plausible shortcut predictors. If a valid simpler model performs as well or better on independent data, the additional model complexity—and any multidimensional integration it claims—has not earned incremental value for that task. [211]

Each anchor may also contain a core and an expanded model. The core contains the subset with the strongest current construct validity and empirical maturity. The expanded model adds prespecified candidate dimensions whose value is less established. A general nested representation is:

$$S_{s,expanded}(t) = \lambda_{core}^{(s)} S_{s,core}(t) + \sum_{j=1}^{m_s} \lambda_j^{(s)} \phi_j^{(s)}(t)$$

where $m_s \geq 1$ is the number of additional prespecified candidate dimensions added beyond the core in that expanded model, with any weight constraints treated as provisional model assumptions rather than biologically derived facts. The expanded model is retained only if it provides prespecified incremental out-of-sample improvement under the primary validation criterion after appropriate control for added complexity. Biological interpretability may support explanation after quantitative success, but it cannot rescue an expanded model that fails to improve independent performance. Multicollinearity, redundancy, and interaction among components must be examined through a prespecified analysis rather than treated as reasons to preserve every dimension.

State-Specific Trajectories

The Friction Signature programme is fundamentally dynamic. A static score may discriminate two endpoints while missing the temporal organization that motivated the Mapping architecture. For anchor s, let $\Phi^{(s)}(t)$ denote the ordered vector of transformed dimensions prospectively retained in the anchor-specific trajectory model. The state-specific trajectory is:

$$\tau_s = \left\langle \Phi^{(s)}(t_1), \Phi^{(s)}(t_2), \dots, \Phi^{(s)}(t_n) \right\rangle$$

For reference, the full six-domain state-specific template is:

$$\Phi_{\text{full}}^{(s)}(t) = [\phi_R^{(s)}(t), \phi_A^{(s)}(t), \phi_M^{(s)}(t), \phi_N^{(s)}(t), \phi_C^{(s)}(t), \phi_T^{(s)}(t)]$$

An anchor-specific trajectory need not instantiate every domain in $\Phi_{\text{full}}^{(s)}(t)$. Its component membership must be declared before confirmatory testing and then held fixed. A trajectory constructed from a prospectively restricted component set is a distinct

model implementation; it does not redefine the six-domain shared Friction Signature architecture. The trajectory can represent direction and rate of change, dwell or persistence, recurrence, temporal ordering, hysteresis, disengagement, recovery, and component-specific lag. The within-window temporal component T remains distinct from this full temporally ordered multivariate evolution.

For anesthesia, a trajectory may span wakefulness, induction, specified suppression, emergence, and recovery. Behavioural loss of responsiveness may be marked as an observed event but must not define phenomenal absence or serve as a universal biological phase boundary. For rumination, a trajectory may span baseline or induction, sustained perseverative processing, persistence, disengagement, and resolution. Exact phase definitions and endpoints must be paradigm-specific and locked before testing. [39, 40, 55]

State separation may be evaluated with an anchor- and method-specific decision function:

$$d_s\left(\Phi_a^{(s)}, \Phi_b^{(s)}\right) > \delta_s$$

where d_s and δ_s are prespecified or development-calibrated and then frozen before holdout testing. Euclidean distance, Mahalanobis distance, probabilistic separation, classification margin, posterior probability, or another multivariate measure may be appropriate in different settings, but these methods are not interchangeable and no generic distance metric is built into the theorem. Demonstrating state separation supports the operational measurement model; it does not by itself validate strict phenomenology–biology identity. [211]

Cross-Anchor Representation

The anesthesia and rumination models may share an operational architecture without sharing empirical units or one common time variable. Even if both scalar scores are normalized to $[0, 1]$, S_{ana} and S_{rum} remain state-specific model summaries generated through different manipulations, baselines, transformations, and measurement schedules. They must not be added or interpreted as a single scale of consciousness, phenomenology, selfhood, or biological cost.

The paired representation is therefore trajectory-level:

$$\mathcal{T}_{anchors} = \langle \tau_{ana}, \tau_{rum} \rangle$$

This notation does not imply that the anchors are measured simultaneously, that their time points are homologous, or that the two trajectory models must retain identical component sets. Any dimension used to support a cross-anchor invariance claim must nevertheless be prospectively declared as shared and must preserve the invariant theoretical meaning specified above. A dimension retained in only one anchor may contribute to that anchor-specific model but cannot by itself support cross-anchor construct invariance. Their scientific relation lies in whether one prespecified shared measurement architecture, one construct-invariance discipline, and one validation logic can survive two substantially different perturbational regimes.

Missing Data and Reduced Models

Missing measurements are nonevaluable, not confirming. A missing component must not be assigned a favourable, neutral, average, or inferred value merely to complete the vector. Prespecified imputation may be used where scientifically and statistically justified, but the imputation model must be developed without holdout leakage and must not manufacture evidence for a missing identity-relevant variable. [211]

Where a dataset lacks one or more dimensions required by the declared model, the result is a reduced model. A deliberately prespecified core or restricted anchor model is not the same as a reduced model produced by unavailable measurements: the

former is an intended model class defined before testing, whereas the latter is an incomplete implementation of a declared model. A reduced model must be identified explicitly and, where it is used for prediction or classification, separately calibrated and validated. Renormalizing the weights of the remaining components does not make the resulting score equivalent to the declared full model, and scores derived from different component sets are not automatically comparable. A dataset containing only network measures therefore tests the network component, a prospectively declared network-only or restricted model if that was the intended model class, or a reduced implementation only when required measurements from an already-declared model are unavailable; it does not by itself test the full shared Friction Signature architecture.

Cross-Method Construct Validity

Generalization across instruments requires construct continuity rather than numerical equivalence. Different instruments may validly estimate different aspects of a theoretical domain, but the relation between each measure and the construct must be prespecified. HRV and cortisol cannot be treated as numerically interchangeable regulatory measures; functional connectivity and effective connectivity cannot be substituted for one another; PCI, Lempel-Ziv complexity, permutation entropy, and other complexity measures cannot be treated as one measurement simply because their results are all expressed numerically. [12, 38, 39, 54, 112, 118, 120, 121]

Cross-method convergence therefore does not require identical raw values or even an identical numerical direction when two instruments index different subproperties. It requires that each measurement behaves in a manner consistent with the prespecified construct-level prediction and that the mapping from instrument to construct survives independent validation. If different methods require incompatible definitions of the supposedly shared construct, construct invariance has failed.

Empirical Revision and Anti-Rescue Rule

Section 17 constrains the ontology, the independently specified phenomenological target, the complete bounded biological event, the separation of Friction Signature measurement from that event, and the requirement for prospective falsifiability. Section 18 proposes the present six-dimensional operational decomposition and its associated measurement models. The theorem does not determine in advance that these six dimensions, an additive score, non-negative weights, or any particular distance metric must be correct.

Empirical evidence may therefore justify retaining, dividing, replacing, or removing dimensions; changing a transformation family; altering an anchor model; or abandoning an unnecessary scalar summary. Such revision is legitimate only when its evidential status remains explicit. Once a confirmatory model is locked, a failed prediction remains a failure of that model. Post hoc changes create a new model generation: [211]

$$\begin{gathered}\text{locked model}\\ \rightarrow\\ \text{independent test}\\ \rightarrow\\ \text{result}\\ \rightarrow\\ \text{failure or partial support}\\ \rightarrow\\ \text{documented new model}\\ \rightarrow\\ \text{new independent validation}\end{gathered}$$

This anti-rescue rule protects the measurement architecture from becoming indefinitely flexible. The current six-domain shared operational architecture is therefore a constrained empirical proposal, not an immutable definition of the biological event.

The quantitative pipeline developed in this subsection can be summarized as:

$$\begin{gathered}\text{observed biology}\\ \rightarrow\\ \text{prespecified dimension construction}\\ \rightarrow\\ \text{state-specific transformation}\\ \rightarrow\\ \text{candidate state-specific representation}\\ \rightarrow\\ \text{trajectory and/or candidate scalar model}\\ \rightarrow\\ \text{independent validation}\end{gathered}$$

The following subsections apply this method separately to reversible anesthesia suppression and sustained rumination, after which the paired architecture can be tested for cross-anchor construct invariance, simpler-model resistance, and the additional coordination-level predictions of the Stochastic Pump.

18.3 Anesthesia Suppression Anchor

The anesthesia anchor provides the first state-specific application of the quantitative method defined in Section 18.2. Its purpose is not to infer absence of phenomenology from behavioural unresponsiveness and not to construct a universal anesthesia score. It tests whether a prespecified suppressive anesthetic regime produces a reproducible, reversible, and agent-specific departure from ordinary wakeful biological organization across selected Friction Signature measurements while downstream access, report, memory, and experiential evidence are tracked separately.

The anchor is therefore defined by the experimental manipulation and its prespecified state criteria rather than by successful expression of the biological model. A confirmatory study must specify the anesthetic agent, dose or concentration regime, depth or clinical/behavioural endpoint, measurement window, wakeful reference, and relevant experience or connectedness assessments before the Friction Signature predictor is tested. Behavioural unresponsiveness may form part of the experimental state definition, but it is not treated as evidence that primary phenomenology is absent. Likewise, later recall, command following, and verbal report provide distinct information about memory, access, behaviour, and expression rather than a single measure of phenomenology.

The lower-anchor shorthand used elsewhere in the manuscript refers only to reversible suppressive perturbation. It does not place anesthesia at the "low" end of a consciousness scale. Different anesthetic agents can produce substantially different combinations of neural complexity, connectivity, metabolism, autonomic regulation, responsiveness, memory, and reported experience. The confirmatory target must therefore be agent- and regime-specific rather than a disjunction in which suppression, preservation, redistribution, reorganization, or uncoupling all count as success after the fact. [39, 75, 220, 221]

The general empirical trajectory is:

$$\begin{gathered}\text{wakeful reference}\\ \rightarrow\\ \text{induction}\\ \rightarrow\\ \text{prespecified suppressive state}\\ \rightarrow\\ \text{emergence}\\ \rightarrow\\ \text{recovery}\end{gathered}$$

but the biological path through these phases need not be symmetric or synchronous. Recovery may include hysteresis, residual drug effects, transitional neural states, and different rates of restoration across biological, cognitive, behavioural, mnemonic, and report variables. Those endpoints must remain separate rather than being combined into one synthetic recovery latency. [40, 50, 55, 216]

Biological Measurement Architecture

The shared operational domain introduced in Section 18.2 is:

$$FS^{(ana)}(t) = [R^{(ana)}(t), A^{(ana)}(t), M^{(ana)}(t), N^{(ana)}(t), C^{(ana)}(t), T^{(ana)}(t)]$$

The expression above is the anesthesia instantiation of the shared six-domain full-domain template defined in Section 18.2; it is not itself the declared confirmatory anesthesia model. Not every domain is presently suitable for inclusion in the confirmatory biological predictor or in every anesthesia trajectory implementation. In the current anesthesia implementation, the strongest candidate biological core comprises network organization, neural or signal complexity, and a purified biological temporal component:

$$FS_{ana,core}(t) = [N^{(ana)}(t), C^{(ana)}(t), T^{(ana)}(t)]$$

This core remains a proposed operational model rather than an empirically established natural decomposition. Existing literature provides substantial component-level evidence that anesthesia can alter large-scale network organization, perturbational or signal complexity, and temporally structured neural state transitions. It does not yet validate the combined lower-anchor model or establish that these three dimensions are uniquely optimal. The model must therefore compete prospectively with its strongest individual components and simpler alternatives. [39, 50, 212–216]

Metabolic/energetic and autonomic/regulatory dimensions are treated as expanded biological components. Recursive/access-related outcomes are retained separately from the confirmatory biological score unless a biologically defined, criterion-independent estimator of recursive organization is developed and validated. This separation prevents responsiveness, report, memory, or state labels from being placed inside a biological predictor that is then claimed to predict those same outcomes.

Network Organization

$N^{(ana)}(t)$ represents the prespecified organization of interactions among distributed neural systems under the tested anesthetic regime. Candidate measurement families include thalamocortical, corticocortical, and frontoparietal functional connectivity; model-based effective or directional connectivity; recurrent interaction; modularity and segregation; dynamic connectivity; and diversity of large-scale network configurations. These are related but non-equivalent observables. A confirmatory model must choose the relevant measurement family and construction rule before testing rather than treating any form of connectivity change as interchangeable evidence.

Propofol studies provide component-level evidence for altered corticocortical, thalamocortical, and frontoparietal organization during reduced responsiveness, while other work has reported changes in effective connectivity and reduced diversity of large-scale functional-connectivity configurations. [212] [213] [214]

These findings do not justify the universal prediction that connectivity simply decreases. Local synchrony or restricted coupling may be preserved or enhanced while broader recurrent, integrative, or directional organization is altered. The confirmatory prediction must therefore identify the particular network relation expected for the named anesthetic regime. For a tested component, the transformed score: [38, 212–214]

$$\phi_N^{(ana)}(t)$$

increases only as the observed network configuration more strongly expresses that **prespecified** target profile. “Reorganization” by itself is not a confirmatory prediction.

Neural and Signal Complexity

$C^{(ana)}(t)$ is restricted to neural or signal complexity, diversity, and dynamical differentiation. It does not denote thermodynamic entropy production. Candidate measures may include Perturbational Complexity Index, TMS-EEG response complexity, Lempel-Ziv complexity, permutation entropy, spectral entropy, signal diversity, and related spontaneous or evoked dynamical measures, but these methods are not numerically or conceptually interchangeable.

Perturbational Complexity Index combines the spatial distribution of an evoked cortical response with an estimate of its algorithmic complexity and was developed for cross-state assessment of integrated and differentiated cortical responses. [215]

The strongest anesthesia boundary comes from comparative perturbational work. Propofol- and xenon-induced unresponsiveness have been associated with markedly reduced perturbational complexity and absence of subsequent experiential reports, whereas ketamine-induced unresponsiveness can preserve wakefulness-like complex cortical responses and be followed by vivid dream-like reports. [39]

Ketamine is therefore not an exception to be discarded. It is a mandatory challenge to any model that equates behavioural unresponsiveness with a universal complexity state:

$$\text{behavioural unresponsiveness} \not\Rightarrow \text{one universal neural-complexity profile}$$

A propofol-specific or xenon-specific complexity model may predict reduced or suppressively altered perturbational complexity, but that prediction cannot be generalized automatically to ketamine or to every spontaneous and evoked complexity measure. Cross-agent generalization is a separate empirical test. The transformed component:

$$\phi_C^{(ana)}(t)$$

therefore represents expression of a frozen agent-, method-, and endpoint-specific complexity profile, not generic departure from wakefulness.

Biological Temporal Organization

The temporal component must remain distinct from the full anesthesia trajectory and from behavioural or report endpoints. In the present lower-anchor model:

$$T^{(ana)}(t)$$

denotes a prespecified **biological within-window temporal feature** of the measured state. Candidate features may include dwell time within a defined electrophysiological or network configuration, transition probability between biological states, persistence or recurrence of a specified neural pattern, temporal stability, or a prespecified hysteresis-related biological feature. Command following, report, memory recovery, cognitive recovery, and inferred narrator continuity are not themselves biological T inputs.

Anesthesia nevertheless provides strong evidence that the broader biological and behavioural course is temporally structured. Propofol studies identify electrophysiological and behavioural signatures associated with loss and recovery transitions. [50] Emergence studies have identified transient cortical states preceding behavioural awakening. [216] Recovery of consciousness and cognition can also unfold through differentiated trajectories rather than returning as one indivisible function. [40]

These studies constrain temporal ordering but do not provide a single universal timestamp for primary phenomenology. Their endpoints and measurement methods differ and must not be arithmetically combined into a synthetic recovery latency. The biological T transform must instead be defined for the particular temporal feature and experiment being tested: [40, 50, 216]

$$\phi_T^{(ana)}(t) = g_T^{(ana)}\left[\begin{array}{c} X_T^{(ana)}(t), \\ B_T^{(ana)} \end{array}\right]$$

with the feature definition, measurement window, baseline, and expected direction or configuration frozen before confirmatory testing.

Downstream Access, Behaviour, Memory, and Experience

The source architecture treated $R^{(ana)}$ as a mixture of command following, behavioural responsiveness, report, recall, memory, executive recovery, connectedness, and narrator-level continuity. That mixture is not suitable as a confirmatory biological predictor because these variables occupy different methodological and architectural roles.

They are therefore retained as **separate downstream or state-characterization outcomes**. Depending upon the experiment, these may include behavioural responsiveness, command following, memory encoding, later recall, coherent report, executive performance, connected experience, disconnected experience, and other prespecified access-related measures. No single one is treated as a complete measure of recursive access, and none is treated as primary phenomenology itself.

The central boundary remains:

$$\text{behavioural unresponsiveness}$$
$$\not\Rightarrow$$
$$\text{absence of primary phenomenology}$$

The distinction between responsiveness and consciousness, including connected and disconnected consciousness, is established in the anesthesia literature. [75] Experimental sedation studies have also reported subjective experiences following both responsive and unresponsive sedative states, while remaining limited to the specific experimental sedation paradigms tested. [217]

These variables remain scientifically important precisely because they permit dissociation. A biological anesthesia model that succeeds only by equating lack of response, lack of recall, or lack of report with phenomenal absence fails the architectural constraint established in Section 17.

If future work develops a biological-only estimator of recursive/access-related organization that is independent of the variables used to define the state or evaluate downstream access, such an estimator may be tested as a new $R^{(ana)}$ component. Until then, the confirmatory biological lower-anchor model remains purified by keeping report, behaviour, memory, and experiential classification outside its predictor.

Metabolic and Energetic Organization

$M^{(ana)}(t)$ represents a **specified metabolic or energetic measurement construct**, not a generic quantity of "organized energetic deployment." Regional or global cerebral glucose utilization, cerebral metabolic rate of oxygen, cerebral blood flow, flow-metabolism coupling, BOLD/hemodynamic measures, and regional redistribution are different observables and must not be treated as interchangeable. [42, 112, 118]

Propofol anesthesia has been associated with substantial regional and global reductions in cerebral glucose metabolism and with altered metabolic and vascular organization. [218] [219]

Agent heterogeneity is important. Comparative metabolic work has reported different regional and whole-brain glucose-metabolic profiles across dexmedetomidine, propofol, sevoflurane, and S-ketamine at equi-sedative target doses. [220] More recent comparative work further supports separating widespread drug-exposure-related metabolic effects from narrower effects associated with behavioural state or connectedness, with S-ketamine again providing an important boundary. [221]

This distinction prevents a major inferential error. A metabolic change caused by drug exposure is not automatically evidence for the biological organization specifically associated with a change in phenomenology or connectedness. The metabolic component must therefore specify the exact measurement family and the agent-specific relation to be tested. A confirmatory prediction cannot remain:

$$M^{(ana)}$$
$$=$$
$$\text{suppressed, redistributed, reorganized, or altered}$$

because that formulation accommodates almost any result. Instead, the target metabolic profile must be defined before holdout testing, and cross-agent transfer must be evaluated separately.

The metabolic component is presently an expanded term. It earns retention only if it provides incremental out-of-sample performance beyond the core and simpler alternatives after drug exposure, dose, region, and other relevant confounds are controlled.

Autonomic and Regulatory Organization

$A^{(ana)}(t)$ is restricted to acute autonomic and regulatory organization. It is not called allostatic load unless a genuine cumulative multisystem allostatic-load construct is separately measured. Candidate measures may include heart rate, heart-rate variability, blood pressure, respiration, baroreflex-related dynamics, cardiorespiratory coupling, or prespecified autonomic responses to stimulation. [120]

Anesthetic agents can substantially alter autonomic function. Dose-related autonomic changes have been reported under isoflurane. [222] Heart-rate variability during propofol anesthesia can also be affected by nociception and analgesia. [223] HRV interpretation in anesthetic and perioperative settings is also sensitive to the anesthetic or medication regimen, ventilation and

respiratory conditions, participant characteristics and cardiovascular comorbidity, surgical or nociceptive stimulation, and recording or analysis methodology. [224] [225] [226] [223]

For these reasons, autonomic/regulatory organization remains an expanded and highly contextual component rather than a primary suppression marker. Its transformation must describe resemblance to a prespecified autonomic pattern under a named regime:

$$\phi_A^{(ana)}(t) = d_A^{(ana)}\left[\mathbf{X}_A^{(ana)}(t), \mathbf{B}_A^{(ana)}\right]$$

rather than assign any increase or decrease a confirming interpretation.

State-Specific Transformation and Candidate Scores

The generic transformation machinery is defined in Section 18.2 and is not re-derived here. For each retained anesthesia component:

$$\phi_i^{(ana)}(t) = g_i^{(ana)}\left[X_i^{(ana)}(t), B_i^{(ana)}\right]$$

where the construction method, baseline, transformation family, direction or target profile, preprocessing, and time window are fixed before confirmatory testing. A bounded value in $[0, 1]$ indicates degree of expression of that prespecified model profile only; it does not create commensurable biological units across components.

A candidate additive core model is:

$$S_{ana,core}(t) = w_N^{(ana)}\phi_N^{(ana)}(t) + w_C^{(ana)}\phi_C^{(ana)}(t) + w_T^{(ana)}\phi_T^{(ana)}(t)$$

with any normalization, non-negativity, or sum-to-one constraints treated as model assumptions under the general rules of Section 18.2. A transparent equal-weight reference may be used:

$$S^{(0)}_{ana,core}(t) = \frac{1}{3}\left[\phi^{(ana)}_{N}(t) + \phi^{(ana)}_{C}(t) + \phi^{(ana)}_{T}(t)\right]$$

but it is an engineering reference model, not an empirically derived biological law.

An expanded candidate model may add the currently secondary metabolic and autonomic components:

$$S_{ana,expanded}(t) = \lambda^{(ana)}_{core} S_{ana,core}(t) + \lambda^{(ana)}_{M}\phi^{(ana)}_{M}(t) + \lambda^{(ana)}_{A}\phi^{(ana)}_{A}(t)$$

The weighting hierarchy is not fixed by the theorem. Weights may be developed or calibrated within designated development data and must then be frozen before independent testing. The expanded model survives only if it yields prespecified incremental performance beyond the core after appropriate complexity penalty. Biological interpretability cannot rescue an expanded component that fails the primary empirical criterion. [211]

For a declared scalar score S_{ana} whose retained transformed components are prospectively oriented so that larger values indicate stronger expression of the specified suppressive target profile, a state ordering such as:

$$S_{ana}(wakeful) < S_{ana}(prespecified\ suppressive\ state)$$

is therefore a prospective prediction on untouched data, not confirmation when the transformations and weights were trained to create that ordering. Likewise, the strongest individual component or another simpler model may outperform the additive index. If so, the additional multidimensional scalar architecture has not earned its role for that test even if the underlying component evidence remains valid.

Multivariate Anesthesia Trajectory

The multivariate trajectory remains primary whenever a scalar summary would obscure asynchronous or non-monotonic change. Consistent with Section 18.2, let $\Phi^{(ana)}_{bio}(t)$ denote the ordered vector of biological dimensions prospectively retained in the declared anesthesia trajectory model. For reference, the current full biological candidate trajectory template is:

$$\Phi^{(ana)}_{bio,full}(t) = [\phi^{(ana)}_{N}(t), \phi^{(ana)}_{C}(t), \phi^{(ana)}_{T}(t), \phi^{(ana)}_{M}(t), \phi^{(ana)}_{A}(t)]$$

This five-domain template is not the complete bounded biological event and is not identical to every anesthesia model tested. The core trajectory retains $N/C/T$; an expanded trajectory may additionally retain M and/or A only when their inclusion is prospectively declared under the Section 18.2 model-generation rules. The shared R domain remains outside the current biological anesthesia trajectory because the available access-, responsiveness-, memory-, report-, and experience-related variables are being used as downstream or state-characterization outcomes rather than as criterion-independent biological predictors. Any

alternative trajectory membership defines a distinct prospectively specified model implementation and does not redefine the shared six-domain Friction Signature architecture.

The anesthesia trajectory is:

$$\tau_{ana} = \left\langle \Phi_{bio}^{(ana)}(t_1), \Phi_{bio}^{(ana)}(t_2), \ldots, \Phi_{bio}^{(ana)}(t_n) \right\rangle$$

with downstream responsiveness, memory, report, connectedness, and cognitive endpoints recorded in parallel rather than inserted into the biological vector.

This separation permits the model to ask whether biological reorganization precedes, accompanies, or follows changes in downstream access without assuming that all components move together. Recovery may be structured but asynchronous. Neural organization may begin to reorganize before behavioural responsiveness returns; cognitive functions may recover on different trajectories; and residual drug effects may outlast the behavioural transition. Endpoint homology is therefore mandatory whenever timings or trajectories are compared. Neural, behavioural, metabolic, cognitive, mnemonic, and report endpoints cannot be substituted for one another merely because each has been called "recovery." [40, 50, 55, 216]

State separation may be tested with an anesthesia-specific decision function:

$$d_{ana}\left(\Phi_{wakeful}^{(ana)}, \Phi_{supp}^{(ana)}\right) > \delta_{ana}$$

where $\Phi_{wakeful}^{(ana)}$ and $\Phi_{supp}^{(ana)}$ must be constructed from the same locked $\Phi_{bio}^{(ana)}$ component membership, construction rules, transformations, and measurement definitions. The decision function and threshold are selected or calibrated only within development data and then frozen before holdout. No particular Euclidean, Mahalanobis, probabilistic, or classification metric is built into the Mapping Theorem.

Boundary Conditions and Agent Holdouts

The most informative tests are not those in which every observable changes in the same expected direction. They are boundary cases in which behavioural, biological, and experiential variables dissociate.

Ketamine is therefore a mandatory agent challenge. A propofol-calibrated suppressive model must not be retroactively broadened so that ketamine is declared "the same state by another route." If the model is intended to generalize across agents, the invariant component definitions and permissible agent-specific manifestations must be declared in advance and tested on held-out agents. If the model is intended only for propofol, that scope should be stated explicitly rather than presenting the result as a universal anesthesia model.

Disconnected consciousness provides a second essential challenge. A condition in which external connectedness or behavioural response is lost while internally generated experience persists must not be classified as phenomenal absence solely because ordinary report is unavailable during the state. Experimental sedation, dream-like experience, and later report provide imperfect but important evidence for this dissociation. [39, 75, 217, 221]

Natural sleep, lighter sedation, paralysis, and disorders of consciousness may provide additional boundary comparisons when endpoint homology and paradigm compatibility are adequate, but they cannot be combined indiscriminately with anesthesia simply because responsiveness is reduced. Each contrast must preserve manipulation, endpoint, and measurement validity.

Validation Architecture

A confirmatory lower-anchor programme must implement the sequence:

$$\begin{gathered}\text{development/calibration}\\ \rightarrow\\ \text{manipulation or agent holdout}\\ \rightarrow\\ \text{participant holdout}\\ \rightarrow\\ \text{external replication or transportability}\end{gathered}$$

The full analysis pipeline must be frozen before confirmatory holdout, including state criteria, component inclusion, measurement methods, preprocessing, artifact rules, baselines, feature construction, transformations, target profiles, weighting, thresholds, time windows, decision metrics, covariates, and primary success/failure criteria. [211]

Five validation questions must remain separate:

1. **State discrimination:** does the frozen biological model distinguish the independently defined suppressive state from the wakeful reference beyond expected within-state variation?

2. **Temporal tracking:** does it prospectively track induction, suppression, emergence, and recovery without requiring one universal component direction or recovery time?

3. **Simpler-model challenge:** does the multidimensional core add reproducible value beyond its strongest single component or other plausible shortcut predictor?

4. **Expanded-model challenge:** do metabolic and autonomic additions provide prespecified incremental performance beyond the core after complexity penalty?

5. **Generalization:** does the locked model survive participant, regime, agent, laboratory, or measurement holdouts for which generalization was claimed?

Success in one question does not imply success in the others. Group-average separation can provide evidence, but where the intended use is organism-relative state tracking, reproducible within-individual trajectories are also required. Development-set ordering or post hoc sensitivity analyses do not substitute for prospective holdout performance.

The reversibility of anesthesia is particularly valuable because the model can be challenged twice within one manipulation: during departure from wakefulness and during recovery toward the reference organization. Induction and recovery need not be mirror images. Hysteresis, transient states, asynchronous component recovery, and residual drug effects are admissible only when specified as part of the trajectory analysis rather than invoked after failure.

Relationship to the Stochastic Pump Test

The anesthesia trajectory also supplies one half of the later Stochastic Pump coordination test. Component evidence that network organization, complexity, metabolism, autonomic regulation, and temporal structure change under anesthesia is not by itself evidence for the Pump. The additional Pump-level claim is that relevant components exhibit prespecified coordination across readiness, induction, suppressive reorganization, emergence, and restored or reorganized availability.

Section 18 will therefore compare a component-only model with a coordination model using the same underlying biological information. Anesthesia contributes support to the Pump only if prespecified cross-component and temporal relations improve independent performance enough to justify the added model complexity. Failure of that coordination test would weaken the Pump as a systems-level construct without invalidating the individual anesthesia components.

Weakening and Failure Conditions

The lower-anchor model is weakened when a frozen confirmatory test fails at the level actually specified. Important failure conditions include failure of the selected biological measures to behave as predicted; failure of an expanded component to add incremental value; failure of the N/C/T core to distinguish or track the independently defined suppressive state; failure of the declared full anesthesia anchor model under adequate measurement; dependence on post hoc signs, profiles, weights, thresholds,

or endpoint substitutions; inability to accommodate ketamine or disconnected-consciousness boundaries within the **prespecified scope**; or failure to generalize across agents or populations for which generalization was claimed.

The failure hierarchy remains:

1. observed-measure failure;
2. expanded-component failure;
3. anchor-core failure;
4. complete-anchor failure;
5. paired-architecture failure;
6. general Mapping-strategy failure.

Failure at one level does not automatically imply failure at every higher level. Conversely, repeated failure cannot be protected indefinitely by invoking unmeasured biology or redefining the tested constructs. A failed locked model remains failed. Any post hoc change constitutes a new model generation requiring new independent validation. [211]

Present Scientific Status

The empirical literature provides substantial component-level support for anesthesia-related changes in network organization, neural complexity, temporal state transitions, cerebral metabolism, autonomic regulation, and dissociations among responsiveness, connectedness, later report, and experience. It also establishes strong agent-specific boundaries, particularly for ketamine. These findings make a prospective lower-anchor model empirically tractable. [39, 40, 50, 75, 212–226]

They do not yet validate the combined N/C/T core, the expanded scalar model, the current full biological candidate trajectory, final transforms or weights, state-separation thresholds, cross-agent invariance, the Pump coordination advantage, component necessity or sufficiency, complete-event necessity or sufficiency, or strict phenomenology–biology identity. Those claims remain prospective, unresolved, or dependent upon new data.

The strongest justified lower-anchor claim is therefore that a prespecified suppressive anesthetic regime should produce a structured and at least partially reversible biological measurement trajectory that can be distinguished from its wakeful reference while remaining dissociable from behavioural responsiveness, report, recall, and connectedness. Prospective success would strengthen the biological measurement architecture and constrain the candidate event. It would not, by itself, establish strict identity.

18.4 Rumination and Sustained Recursive-Load Anchor

The rumination anchor provides the second state-specific application of the quantitative method established in Section 18.2. Its purpose is not to measure consciousness, assign a higher value to "more thought," or imply that all self-reference, negative affect, mind-wandering, or demanding cognition shares one biological organization. It asks whether an independently characterized state of sustained rumination is accompanied by a reproducible biological measurement trajectory that can be distinguished from appropriately matched non-ruminative cognition and that survives prospective tests of specificity, temporal persistence, generalization, and simpler-model competition.

The term *upper anchor* is retained only as shorthand for sustained recursive or perseverative load. It does not denote an upper point on a consciousness scale. Rumination is empirically characterized as repetitive, often self-focused thought concerning distress and its causes, meanings, consequences, or implications, and is associated with impaired problem solving and interference with instrumental behaviour. [227] Within the present framework, interpreting such cognition as recursive audit or as an instance of psychological time is a framework-level interpretation rather than an independently established neuroscientific entity.

The experimental order must therefore remain:

$$\begin{gathered}\text{independent rumination criterion}\\ \rightarrow\\ \text{biological predictor}\\ \rightarrow\\ \text{downstream/report variables}\end{gathered}$$

State-rumination ratings, brooding scales, repetitive-negative-thinking measures, thought sampling, self-referential appraisal, recurrence, duration, and difficulty disengaging may contribute to the independent state criterion where scientifically appropriate.

They cannot then be inserted unqualified into the biological predictor and counted again as independent evidence that the predictor detects rumination. This separation is essential because the earlier $R + T + N$ core partly defined the target state with R and T and then asked that same score to discriminate the state. [211]

The general trajectory under study is:

$$\begin{gathered}\text{non-ruminative comparison}\\ \rightarrow\\ \text{rumination induction or onset}\\ \rightarrow\\ \text{sustained rumination}\\ \rightarrow\\ \text{disengagement}\\ \rightarrow\\ \text{resolution or recovery}\end{gathered}$$

but the biological components need not change monotonically or recover simultaneously. The primary prediction is a prespecified biological trajectory—multivariate where the prospectively retained model contains multiple biological components—not a universal increase in biological activity or a guaranteed rise and fall of one scalar index.

Independent State Criterion and Framework Interpretation

The target state must be specified before the biological model is tested. A confirmatory study should distinguish active state rumination from trait susceptibility, depressive rumination, brooding, worry, general repetitive negative thought, ordinary self-reference, and spontaneous mind-wandering. Trait rumination can inform susceptibility or stratification, but it is not equivalent to current state expression: [227]

$$\begin{gathered}\text{trait susceptibility}\\ \neq\\ \text{current rumination state}\end{gathered}$$

The criterion may combine a prespecified induction, validated state-rumination report, content sampling, behavioural evidence of sustained self-focused processing, or other independently justified indicators. If a neural or physiological variable is used to construct the biological predictor, it must not also be used to define the target state in the confirmatory test.

Within the Mapping framework, sustained rumination is interpreted as a case in which memory-dependent representational activity repeatedly reconstructs, evaluates, or anticipates self-relevant content and thereby alters the organism's present biological condition. The initiating event may no longer be present while the representation continues to influence ongoing physiology and neural organization. That interpretation connects rumination to the manuscript's L2 and psychological-time architecture, but the biological model must succeed without defining rumination by that interpretation.

Biological Measurement Architecture

The anesthesia-independent shared architecture from Section 18.2 is instantiated here as the rumination state-specific six-domain full-domain template:

$$FS^{(rum)}(t) = [R^{(rum)}(t), A^{(rum)}(t), M^{(rum)}(t), N^{(rum)}(t), C^{(rum)}(t), T^{(rum)}(t)]$$

The expression above is the rumination instantiation of the shared six-domain full-domain template; it is not itself the declared confirmatory rumination model. The six labels do not imply that all six are currently validated biological predictors of rumination. In the present operationalization, $N^{(rum)}$ is the clearest candidate biological component because it can be defined through independently observed neural organization without requiring the rumination label to be inserted into the predictor. A purified biological $T^{(rum)}$ may be included when it is constructed from biological persistence, recovery, recurrence, dwell, or transition measures that are independent of the cognitive persistence measures used to define the state.

Accordingly, the most conservative current core is:

$$FS_{rum,core}(t) = [N^{(rum)}(t), T^{(rum)}_{bio}(t)]$$

when a criterion-independent biological temporal measure is available. Here $T_{bio}^{(rum)}$ is the criterion-independent biological implementation of the shared $T^{(rum)}$ domain for this anchor. If the evidence and measurement design do not justify a valid biological temporal component before confirmatory testing, a prospectively declared network-only core is the appropriate intended core model rather than a contaminated multidimensional score. By contrast, if an $N + T_{bio}$ model has already been declared but a dataset cannot instantiate its required biological temporal measurement, that dataset yields a reduced implementation under the Section 18.2 missing-data rules and must be identified, calibrated, and validated separately. Neither case licenses criterion-defined persistence to be inserted into the biological predictor.

Autonomic/regulatory organization and dynamical organization are candidate expanded biological dimensions. Direct metabolic/energetic measurement of state rumination remains a future empirical target. Recursive self-reference, report, and state-defining persistence remain outside the confirmatory biological predictor unless future work establishes biological estimators that are independent of the criterion and demonstrate construct validity.

Network Organization

$N^{(rum)}(t)$ denotes a prespecified pattern of activity or interaction among neural systems relevant to the tested rumination paradigm. Candidate measurement families include default-mode-network subsystem involvement, medial and dorsomedial prefrontal activity, posterior cingulate or precuneus activity, functional connectivity, cross-network coupling, dynamic connectivity, and recurrent occupancy of network configurations. These observables are not interchangeable and require method-specific construction and validation.

Meta-analysis has implicated default-mode-network core regions and the dorsomedial prefrontal subsystem in rumination across functional neuroimaging studies. [228] This supports involvement of self-referential and internally oriented network organization but does not establish one universal rumination configuration or a specific clinical biomarker.

In major depressive disorder, meta-analytic work has reported increased connectivity between the default-mode network and subgenual prefrontal cortex, with relationships to depressive rumination. [229] This evidence is relevant to depressive rumination but is not equivalent to a clean induced state-rumination signature.

A broader meta-analysis of perseverative cognition has implicated medial frontal, cingulate, insular, and posterior cingulate regions across rumination and worry paradigms. [21] Its scope therefore supports a broader perseverative-cognition architecture rather than a uniquely rumination-specific network profile.

The model explicitly rejects:

$$\text{default-mode-network activity} = \text{rumination}$$

The confirmatory prediction must instead specify the exact paradigm, network measurement family, comparison state, expected configuration, allowable variability, and failure criterion before validation. A phrase such as “recruited, coupled, or reorganized” is a development-level description, not a confirmatory hypothesis. [36, 119, 201, 228, 229]

For a locked network target, the transformed component is:

$$\phi_N^{(rum)}(t) = g_N^{(rum)}\left[X_N^{(rum)}(t), B_N^{(rum)}\right]$$

where the transformation quantifies expression of the prespecified network profile rather than generic departure from rest.

Biological Temporal Organization

The psychological definition of rumination includes persistence, recurrence, and difficulty disengaging. Those properties therefore cannot simply be placed inside a biological T predictor and then treated as independent evidence that the predictor identifies rumination.

The biological temporal component is instead:

$$T_{bio}^{(rum)}(t)$$

and denotes a prespecified within-window temporal property of the measured biological state. Candidate features may include delayed physiological recovery after an independently identified rumination interval, recurrent occupancy of a neural configuration, biologically measured dwell time, transition probability, persistence of a specified network pattern, temporal lag between independently identified cognitive disengagement and biological recovery, or another criterion-independent temporal feature.

The perseverative-cognition hypothesis proposes that worry, rumination, and anticipatory cognition can prolong affective and physiological activation beyond the immediate stressor. [13] Meta-analytic evidence in healthy participants also supports physiological associations across perseverative cognition, including cardiovascular, autonomic, and endocrine measures. [12] These findings are broader than rumination alone and do not establish a uniquely rumination-specific biological temporal signature.

Cortisol evidence likewise depends strongly on how rumination is defined. State and post-stress rumination paradigms have generally produced more consistent associations than trait-based approaches, while the broader literature remains heterogeneous. [230]

Accordingly, a biological T component must be frozen for the actual paradigm rather than defined generically as "persistence." Its transformation is:

$$\phi_T^{(rum)}(t) = g_T^{(rum)}\left[X_{T,bio}^{(rum)}(t), B_T^{(rum)}\right]$$

only when the temporal measurement is independent of the criterion used to establish that rumination occurred. For compactness, $\phi_T^{(rum)}(t)$ denotes the transformed score derived from the criterion-independent $T_{bio}^{(rum)}$ implementation. The state-specific trajectory as a whole remains analytically distinct from this within-window temporal component.

Autonomic and Regulatory Organization

$A^{(rum)}(t)$ denotes acute or post-event autonomic and regulatory organization associated with the tested rumination or perseverative-cognition paradigm. It does not denote cumulative allostatic load unless a genuine longitudinal or multisystem allostatic-load index is explicitly measured.

Candidate observables include heart rate, heart-rate variability, blood pressure, electrodermal activity, respiration, cortisol, sympathetic–parasympathetic indices, and recovery dynamics. The perseverative-cognition literature supports associations with multiple physiological systems, but the magnitude and direction of those associations vary with how perseverative cognition is operationalized, including state versus trait assessment, induction method, rumination versus worry focus, sex, ethnicity, assessment duration, study quality, and the particular physiological measure. [13] [12]

The relevant construct is therefore **autonomic/regulatory activation and recovery**, not a universal "allostatic load" increase. A target component must specify the measurement family and expected time course prospectively:

$$\phi_A^{(rum)}(t) = d_A^{(rum)} \left[\mathbf{X}_A^{(rum)}(t), \mathbf{B}_A^{(rum)} \right]$$

where the reference profile and decision rule are frozen before confirmatory testing. Immediate emotional arousal is an important alternative explanation. The autonomic component earns rumination-specific value only if it contributes beyond the physiological effects of negative affect, stressor intensity, and generic arousal.

Metabolic, Hemodynamic, and Energetic Status

The original upper-anchor model grouped BOLD, blood flow, oxygenation, neural recruitment, persistence, glucose metabolism, and oxygen metabolism into one $M^{(rum)}$ construct. That grouping is not presently justified.

Most current rumination neuroimaging evidence is BOLD- or connectivity-based. Such evidence supports neural and hemodynamic recruitment but does not directly measure glucose utilization, cerebral oxygen consumption, ATP turnover, heat production, lactate flux, calorimetry, or total thermodynamic cost. BOLD must therefore remain a hemodynamic signal rather than being relabelled as direct metabolic power. [42, 112, 118]

Induced-rumination and meta-analytic studies provide useful evidence for neural/hemodynamic recruitment of self-referential, affective, and control-related systems. [231] [228] [21] These studies do not establish a direct metabolic Friction Signature component.

Accordingly, within the audited literature, direct state-rumination metabolic quantification remains:

$$M_{direct}^{(rum)} = [\text{NDR}]$$

for glucose utilization, $CMRO_2$, ATP turnover, calorimetry, or total energetic/thermodynamic cost. Hemodynamic variables may be tested as hemodynamic predictors where scientifically useful, but they should not be presented as a validated metabolic component. If future studies obtain direct metabolic measurements, $M^{(rum)}$ can be added as a new prespecified component and tested for incremental value.

Dynamical Organization and Constraint

The rumination C dimension is better described as **dynamical organization, flexibility, recurrence, and stability** than as "complexity/entropy." Thermodynamic entropy production is not part of this construct. Candidate measures may include dynamic functional connectivity, network stability, flexibility, state-transition probability, recurrent occupancy, dwell time, EEG spatiotemporal complexity, or other prespecified dynamical measures.

Induced continuous rumination in healthy participants has been associated with a specific dynamic-stability pattern: hypostability within default-mode-network regions and hyperstability within frontoparietal-control-network regions relative to comparison conditions. [232] This is useful direct state-level evidence but does not establish a universal direction for all dynamical measures.

A dynamic connectivity model centred on the dorsomedial prefrontal cortex has predicted trait/depressive-rumination questionnaire scores across several subclinical samples, but the reported predictive effects were modest and clinical generalization was incomplete. [233] A later preregistered adolescent study found that the adult model did not generalize to a large adolescent sample; newly developed linear models also failed held-out generalization, and an exploratory nonlinear model failed external generalization. [234] This boundary is important because it shows that dynamic-connectivity structure cannot be universalized from one population or model family.

Resting-state EEG work in major depressive disorder has additionally associated rumination measures with altered spatiotemporal complexity, but this evidence is neither an induced state-rumination experiment nor a universal rumination signature. [235]

The dynamical component must therefore be paradigm- and method-specific:

$$\phi_C^{(rum)}(t) = d_C^{(rum)} \left[\mathbf{X}_C^{(rum)}(t), \mathbf{B}_C^{(rum)} \right]$$

with the exact target configuration frozen before confirmatory testing. “Constrained,” “recurrent,” “inflexible,” and “reorganized” cannot remain a menu from which any observed pattern is retrospectively declared supportive.

Because dynamical connectivity, recurrence, dwell time, and stability can overlap with both N and T_{bio}, the model must test shared variance, multicollinearity, and incremental value before treating C as an independent component. [211]

Focused Practical Attention and Orthogonal Controls

Focused practical attention is one of the strongest prospective dissociation tests available to the upper anchor. It directly challenges the possibility that the model merely detects sustained cognition, internal attention, cognitive effort, task duration, arousal, or executive-control recruitment. [33–35, 68]

The primary comparison is not:

$$\text{rumination} > \text{rest}$$

alone. A stronger test is whether the frozen biological model can distinguish independently characterized rumination from sustained, goal-directed practical cognition matched as closely as feasible for duration, difficulty, sensory input, motor demand, and general cognitive effort.

Additional orthogonal controls strengthen construct specificity: negative affect without rumination; self-reference without perseveration; sustained cognition without self-reference; ordinary mind-wandering; and, where scientifically appropriate, worry as a related but non-identical form of perseverative cognition. These contrasts prevent the model from succeeding by detecting valence, self-reference, duration, effort, or internal attention alone.

The framework predicts that rumination and focused practical attention should differ in the biological organization associated with sustained perseveration, but the exact difference is prospective and must be operationalized for the specific paradigm. Focused attention is not assumed to be metabolically inexpensive, neurally inactive, temporally brief, or biologically simple.

Candidate Core and Expanded Models

The generic transformation and calibration machinery is already defined in Section 18.2 and is not repeated here. The current rumination architecture places independently defined rumination outside the biological predictor and begins with the strongest biologically separable components.

Where both network and criterion-independent biological temporal measurements are available, a candidate additive core may be written:

$$S_{rum,core}(t) = w_N^{(rum)} \phi_N^{(rum)}(t) + w_T^{(rum)} \phi_T^{(rum)}(t)$$

with any non-negative or sum-to-one constraints treated as provisional model assumptions rather than consequences of the Mapping Theorem. An equal-weight form may serve as a transparent reference:

$$S^{(0)}_{rum,core}(t) = \frac{1}{2}\left[\phi^{(rum)}_{N}(t) + \phi^{(rum)}_{T}(t)\right]$$

If a clean biological T measure is not justified before model declaration, a network-only core becomes the appropriate prospectively declared confirmatory baseline rather than inserting criterion-contaminated persistence into the score. If T_{bio} was required by an already declared model but is unavailable in a particular dataset, the resulting implementation is instead a reduced model under Section 18.2 and requires separate calibration and validation.

Candidate expanded models may add autonomic/regulatory and dynamical components:

$$S_{rum,expanded}(t) = \lambda^{(rum)}_{core} S_{rum,core}(t) + \lambda^{(rum)}_{A}\phi^{(rum)}_{A}(t) + \lambda^{(rum)}_{C}\phi^{(rum)}_{C}(t)$$

Direct metabolic measurement should enter only after suitable data exist and the component has been prespecified. The expanded model is not preferred because it is richer. It survives only if it provides prespecified incremental out-of-sample performance beyond the core and strongest simpler alternatives after appropriate complexity penalty. Biological or conceptual interpretability cannot rescue an expanded component that fails its primary empirical criterion.

The scalar score is secondary to the trajectory-based representation. Async recovery, non-monotonic dynamics, or opposite changes across components may make a simple rise/fall expectation inappropriate. Any scalar ordering must therefore be prespecified and tested rather than assumed from the existence of rumination.

Rumination Trajectory

Consistent with Section 18.2, let $\Phi^{(rum)}_{bio}(t)$ denote the ordered vector of biological dimensions prospectively retained in the declared rumination trajectory model. For reference, the current full biological candidate trajectory template is:

$$\Phi^{(rum)}_{bio,full}(t) = [\phi^{(rum)}_{N}(t), \phi^{(rum)}_{T}(t), \phi^{(rum)}_{A}(t), \phi^{(rum)}_{C}(t)]$$

This four-domain template is not the complete bounded biological event and is not identical to the shared six-domain Friction Signature template or to every rumination model tested. The current core trajectory retains $N + T_{bio}$ when a criterion-independent biological temporal component is prospectively justified; a network-only core may instead be declared prospectively when it is not. Expanded trajectories may additionally retain A and/or C only when their inclusion is declared before confirmatory testing. The shared R domain remains outside the current biological rumination trajectory because state-defining self-reference, recurrence, duration, and report variables are used as criterion or downstream measures rather than criterion-independent biological predictors. Direct M remains outside the current trajectory because direct state-rumination metabolic quantification is presently [NDR] within the audited literature. Any alternative trajectory membership defines a distinct prospectively specified model implementation and does not redefine the shared six-domain Friction Signature architecture.

The trajectory is:

$$\tau_{rum} = \left\langle \Phi_{bio}^{(rum)}(t_1), \Phi_{bio}^{(rum)}(t_2), \ldots, \Phi_{bio}^{(rum)}(t_n) \right\rangle$$

while state-rumination ratings, content reports, recurrence measures used in the criterion, and other access/report variables are recorded separately.

This permits the model to ask whether biological organization changes during induction or onset, remains altered while rumination is independently present, and reorganizes during disengagement or recovery. Neural, autonomic, endocrine, and subjective measures may recover at different rates. Such lags are part of the trajectory rather than noise to be averaged away.

For a particular comparison, state separation may be tested with a rumination-specific decision function:

$$d_{rum}\left(\Phi_{comparison}^{(rum)}, \Phi_{rumination}^{(rum)}\right) > \delta_{rum}$$

where $\Phi_{comparison}^{(rum)}$ and $\Phi_{rumination}^{(rum)}$ must be constructed from the same locked $\Phi_{bio}^{(rum)}$ component membership, construction rules, transformations, and measurement definitions. The decision function, target profile, and threshold are developed or calibrated before the final holdout and then frozen. The equation tests the biological measurement model, not the phenomenological identity proposition itself.

Validation Architecture

A confirmatory upper-anchor programme must use:

$$\text{development/calibration} \rightarrow \text{manipulation or task holdout} \rightarrow \text{participant holdout} \rightarrow \text{external replication or transportability}$$

The state criterion, biological variables, preprocessing, feature construction, transformations, profiles, weights, thresholds, windows, decision metrics, comparison states, and success/failure criteria must be frozen before final evaluation. Supervised transformations, classifiers, prototypes, or feature-selection procedures must remain entirely inside development data. [211]

Five validation questions remain separate:

1. **State discrimination:** does the biological model distinguish independently characterized rumination from its prespecified comparison state?

2. **Temporal tracking:** does it track onset or induction, persistence while the criterion remains satisfied, disengagement, and biological recovery?

3. **Simpler-model challenge:** where multidimensional integration is claimed, does that model outperform or otherwise provide a prespecified reproducible advantage over its strongest isolated component or shortcut predictor; where the declared core is unidimensional, does it provide reproducible value beyond the strongest relevant shortcut or non-biological comparator?

4. **Expanded-model challenge:** do autonomic/regulatory or dynamical additions improve independent performance beyond the core after complexity penalty?

5. **Generalization:** does the frozen model survive new participants, tasks, inductions, populations, or external datasets for which generalization is claimed?

Focused practical attention should be a primary manipulation-level holdout or comparison wherever feasible. Negative affect, arousal, task difficulty, self-reference, and trait rumination should also be tested as alternative explanations or shortcut predictors rather than assumed away.

Group-level separation can provide useful evidence, but where the intended model is organism-relative state tracking, reproducible within-individual trajectories are essential. Generalization from induced state rumination to everyday perseverative cognition or clinical rumination is a separate achievement and must not be obtained by changing construct definitions after a failed transfer. [211, 234]

Relationship to the Stochastic Pump Test

The rumination trajectory provides the complementary condition for testing the Stochastic Pump. Component-level evidence that network, autonomic, and dynamical measures change during perseverative cognition does not by itself establish a Pump-level organization.

The additional Pump prediction is that a prespecified coordination structure should capture how biological readiness, recurrent recruitment, persistence, containment or failed disengagement, and eventual restoration or reorganization of availability unfold across the rumination trajectory. A Pump-coordination model must use the same underlying biological information as the component-only model and earn its additional complexity through independent performance.

A particularly informative upper-anchor Pump test concerns disengagement. If the Pump construct is useful, prespecified cross-component and temporal relations should improve prediction or tracking of persistence and recovery beyond the component values taken separately. Failure of that comparison would weaken the Pump as a distinct systems-level construct without invalidating the rumination-related component measurements.

Weakening and Failure Conditions

The rumination anchor is weakened when a frozen model fails at the level actually tested. Important failure conditions include failure to distinguish rumination from matched focused practical attention; failure to distinguish rumination from negative affect without perseveration or from ordinary mind-wandering; network performance explainable by generic internal attention or task demand; autonomic effects explainable entirely by immediate arousal or stress intensity; hemodynamic effects explainable by generic cognitive effort; repeated post hoc redefinition of dynamical organization; failure of expanded components to add incremental value; failure of the model to track disengagement and recovery; or failure to generalize across genuinely homologous tasks or populations for which generalization was claimed.

A model also fails methodologically if state-rumination ratings, duration, recurrence, or other criterion variables are recycled into the biological predictor and then treated as independent confirmation. Such contamination cannot be repaired by assigning those variables smaller weights. The predictor class itself must be corrected.

The established failure hierarchy applies:

1. observed-measure failure;

2. expanded-component failure;

3. anchor-core failure;

4. complete-anchor failure;

5. paired-architecture failure;

6. general Mapping-strategy failure.

Failure at one level does not automatically entail failure at every higher level. A network marker may fail while the broader anchor remains viable; an expanded component may fail without invalidating the core; and an upper-anchor failure does not by itself establish general Mapping-strategy failure. Conversely, a failed locked model cannot be rescued retrospectively by changing the state definition, variable set, transform, target profile, weight, or threshold. Such changes create a new model generation requiring new independent validation. [211]

Present Scientific Status

Current literature supports the empirical reality of rumination and perseverative cognition, their temporal persistence, relevant neural-network involvement, and physiological concomitants. It also supplies useful direct state-level evidence for dynamic network reorganization during induced rumination and important negative evidence against universalizing one trait-rumination connectivity model across populations. [12, 13, 21, 227–235]

The literature does **not** validate the earlier proposed biological $R/T/N$ core. The current criterion-independent $N + T_{bio}$ core remains prospective when a valid biological temporal component is available, while a prospectively declared network-only core is an alternative intended core model when it is not. A dataset that cannot instantiate a biological temporal component required by an already declared $N + T_{bio}$ model instead yields a reduced implementation under Section 18.2. Nor does the literature validate the current full biological candidate trajectory, one universal rumination network configuration, a direct state-rumination metabolic/energetic component, one universal dynamical-complexity signature, final model weights or thresholds, cross-population generalization, Pump coordination advantage, component necessity or sufficiency, complete-event necessity or sufficiency, or strict phenomenology–biology identity.

The strongest justified upper-anchor claim is therefore that independently characterized sustained rumination should be accompanied by a prespecified biological measurement trajectory that can be tested against matched non-ruminative cognition, tracked through persistence and disengagement, challenged by orthogonal controls, and compared prospectively with simpler biological models. Success would strengthen the Mapping programme's operational architecture under sustained perseverative cognition. It would not, by itself, establish strict identity.

18.5 Paired-Anchor Integration

The anesthesia and rumination anchors are scientifically useful as separate state-specific models, but their stronger role within the Mapping programme is to test whether one constrained operational architecture can survive two substantially different perturbational regimes without changing its central meanings after the results are known. The anesthesia anchor tests reversible suppressive disruption and recovery. The rumination anchor tests sustained perseverative organization and disengagement. Neither prospectively declared full anchor model has yet been validated, and their integration is therefore a candidate paired architecture rather than an established common biological state-space.

The scientific value of the pair lies in **constraint**. If the two anchors can be made to succeed only by redefining shared variables, changing admissible transformations after failure, or introducing unrelated explanatory rules for each condition, then pairing them adds little. If, by contrast, invariant construct meanings, common validation rules, limited state-specific transformations, and prespecified failure conditions survive both anchors, explanatory freedom is reduced.

Complementary Anchors, Not a Consciousness Scale

The terms *lower* and *upper* remain perturbational shorthand only. Anesthesia does not represent "less phenomenology," and rumination does not represent "more phenomenology." The two anchors are not opposite points on a linear scale and need not exhibit geometrically symmetric, numerically opposite, or temporally homologous trajectories.

Where state-specific scalar summaries are retained, they may be denoted:

$$S_{ana}$$

and:

$$S_{rum}$$

but they must not be summed as though their total represented consciousness, phenomenology, selfhood, recursive load, or biological cost. A normalized value in one anchor has no automatic numerical equivalence to the same normalized value in the other.

An abstract ordered pair may be used for bookkeeping:

$$\mathcal{S}_{anchors} = \langle S_{ana}, S_{rum} \rangle$$

but this notation does not imply simultaneity, common units, metric commensurability, or a validated two-dimensional biological state-space. The primary paired object is instead the ordered pair of independently sampled anchor trajectories:

$$\mathcal{T}_{anchors} = \langle \tau_{ana}, \tau_{rum} \rangle$$

where the two trajectories may derive from different participants, experiments, instruments, and observation times. Consistent with Sections 18.3 and 18.4, their prospectively declared component memberships may also differ. The ordered pair $\mathcal{T}_{anchors}$ is therefore a bookkeeping representation, not a concatenated vector or a common metric object. Direct numerical distance between the complete anesthesia and rumination trajectories is not defined unless a separate shared-domain projection and comparison rule are prospectively specified and validated.

From Shared Labels to an Invariant Domain Dictionary

Section 18.2 introduced the proposed operational decomposition:

$$FS(t) = [R(t), A(t), M(t), N(t), C(t), T(t)]$$

The paired architecture does not assume that all six dimensions are established biological natural kinds or that all six must be active predictors in every anchor. Nor does using the same label in two models establish that the same latent construct has been measured.

The controlling rule is:

$$\text{same label} \neq \text{same construct}$$

For any domain retained as shared across anchors, the following must be frozen before paired validation:

1. its invariant theoretical meaning;
2. the state-specific manifestations that are allowed;
3. the meaning changes that are prohibited;
4. the eligible measurement families;
5. the construct-validity criterion;
6. the condition under which cross-anchor invariance fails.

The paired architecture is therefore best understood at present as **two anchor-specific operational spaces linked by an invariant domain dictionary**, not as one already validated common coordinate system. Membership in the six-domain dictionary does not by itself place a domain inside both tested anchor models. Direct cross-anchor invariance evidence can be supplied only by domains prospectively retained in both relevant anchor-specific models under the same frozen theoretical meaning. A domain retained in only one anchor may remain useful within that anchor, but it cannot by itself count as evidence that the paired architecture has established cross-anchor construct continuity for that domain.

Current Cross-Anchor Status of the Proposed Domains

Network Organization

N is presently the strongest candidate for genuine cross-anchor continuity. Its invariant theoretical meaning can be stated as:

organization of interactions among distributed neural systems.

Under anesthesia, the relevant manifestation may involve agent-specific changes in thalamocortical, corticocortical, frontoparietal, recurrent, effective, or dynamic network organization. Under rumination, the manifestation may involve prespecified self-referential, affective, control-related, or dynamic network organization.

The invariant construct is not "connectivity" in the abstract. Functional connectivity, effective connectivity, topology, integration, modularity, and dynamic connectivity remain distinct measurement families. A cross-anchor network claim survives only if the relation between each measurement and the invariant construct is specified in advance and remains stable across the two programmes. [38, 39, 212–215, 228, 229, 232–234]

Autonomic and Regulatory Organization

The shared meaning of A is restricted to **autonomic and regulatory organization**. Acute anesthesia effects and rumination-related regulatory persistence are different state-specific manifestations of that broad biological class. Neither is automatically allostatic load. A genuine cumulative multisystem allostatic-load measure would constitute a separate longer-horizon construct. [12, 13, 120, 222–226]

Cross-anchor continuity therefore requires that the same regulatory meaning be preserved while permitting different drugs, stressors, recovery dynamics, and measurement methods. Anesthesia-specific pharmacological effects and rumination-related autonomic persistence cannot be declared equivalent merely because both are represented under A.

Metabolic and Energetic Organization

The invariant meaning of M is direct or explicitly modelled **metabolic and energetic organization**. The present empirical maturity of this domain is asymmetric. Anesthesia provides comparatively direct metabolic evidence, including PET-based measurements, whereas the current rumination literature is dominated by BOLD, connectivity, and other hemodynamic or neural measures. [42, 112, 118, 218–221]

Consequently, a direct paired metabolic invariance test is not yet available. Direct rumination measurement of glucose utilization, oxygen metabolism, ATP-related energetic demand, calorimetry, or another valid direct metabolic construct remains new-data-required. The absence of equivalent rumination measurements must be reported as an empirical limitation rather than bridged by relabelling BOLD as metabolism. Until such data exist and are prospectively incorporated, M cannot contribute direct evidence for paired metabolic construct invariance.

Neural Dynamical Organization

The earlier shared label "complexity/entropy" is not retained. Thermodynamic entropy production is separate from neural or signal complexity and from network stability, flexibility, recurrence, or dwell structure.

A possible shared domain is **neural dynamical organization**, but its cross-anchor validity remains unresolved. Under anesthesia, candidate measures include perturbational or signal complexity and related measures of integrated/differentiated dynamics. Under rumination, current evidence more often concerns stability, flexibility, recurrence, switching, and dynamic connectivity. [39, 215, 232–235]

If these cannot be related to one invariant construct without excessive abstraction, C should not be forced into the paired architecture. Removal or decomposition of the domain would constitute revision of the operational model, not failure of the Mapping proposition itself.

Biological Temporal Organization

A shared temporal domain is possible only if T refers to a criterion-independent biological property rather than to the psychological or behavioural definition of the state. The invariant meaning is therefore limited to a prespecified **within-window temporal organization of the measured biological state**.

Under anesthesia, this may involve biological dwell, transition, recurrence, or recovery structure. Under rumination, it may involve biologically measured persistence, recurrence, disengagement, or lag after the state has been independently identified. Behavioural responsiveness, report, state-rumination duration, difficulty disengaging, or cognitive recovery cannot be inserted directly into the biological T predictor when those same variables define the state or evaluate its downstream consequences. [12, 13, 40, 50, 216, 230]

Whether one sufficiently specific temporal construct can survive both anchors remains an empirical question. If not, anchor-specific temporal measures may remain useful while the shared T claim fails.

Recursive and Access-Related Organization

The earlier R crosswalk does not presently qualify as a clean biological paired-domain test. In anesthesia, command following, report, memory, recall, and related variables are downstream access outcomes. In rumination, state-rumination ratings, self-reference, brooding, thought sampling, recurrence, and related measures partly define the target state. [75, 217, 227]

Placing those variables inside a biological predictor would reintroduce predictor–criterion contamination. The current paired architecture therefore keeps recursive/access-related variables outside the confirmatory biological predictor unless a genuinely biological and criterion-independent estimator is developed and validated.

The framework may still interpret distributed access and recursive processes in L2 terms, but successful anchor models would not directly observe one established biological entity called the narrator.

Shared Methodological Architecture

The paired claim is stronger than two independent successful classifiers only if both anchors are governed by common methodological rules. The following requirements therefore apply across the pair:

- state criteria are independently defined before biological prediction;
- predictor variables are insulated from criterion variables;
- admissible measurement families are declared before confirmatory testing;
- transformations and target profiles are developed and then frozen;
- supervised construction remains within development data;
- anchor-specific decision functions are defined according to their actual mathematical meaning;
- manipulation or task holdouts are distinguished from participant holdouts;
- stronger simpler models are tested rather than assumed inferior;
- expanded models must earn their added complexity;
- failed locked models remain failed;
- post hoc changes create a new model generation requiring new independent validation. [211]

Shared transformation notation such as:

$$\phi_i^{(s)}(t) = g_i^{(s)}\left[X_i^{(s)}(t), B_i^{(s)}\right]$$

provides formal continuity only. It does not establish cross-anchor construct invariance. Because the state-specific function $g_i^{(s)}$ can differ between anchors, the permissible transformation family itself must be restricted in advance so that anchor-specific flexibility cannot silently restore whatever result the paired architecture needs.

Likewise, common scaling to:

$[0, 1]$

solves a normalization problem only. It does not create common biological units, equal reliability, equal information content, or a validated shared metric geometry.

True Paired-Anchor Tests

The paired architecture must be tested by more than placing two successful within-anchor results side by side. A genuine paired test requires, before confirmatory evaluation, that the shared-domain dictionary and prohibited semantic changes be frozen across both anchors.

The strongest paired sequence is:

$$\text{freeze invariant domain definitions}$$
$$\rightarrow$$
$$\text{build anchor-specific biological models}$$
$$\rightarrow$$
$$\text{freeze admissible state-specific manifestations}$$
$$\rightarrow$$
$$\text{test anesthesia holdouts}$$
$$\rightarrow$$
$$\text{test rumination holdouts}$$
$$\rightarrow$$
$$\text{test cross-anchor construct invariance}$$

A paired pass therefore requires both adequate anchor-level performance **and** survival of the invariance test. Two anchor successes are insufficient if a shared domain means one thing under anesthesia and another under rumination.

Conversely, a Level-5 paired-architecture failure can occur even when both anchors remain individually useful:

$$\text{anesthesia anchor passes}$$
$$\wedge$$
$$\text{rumination anchor passes}$$
$$\wedge$$
$$\text{shared construct invariance fails}$$

In that case the anchor models survive, but the claim that they instantiate one constrained paired architecture fails.

Stronger-Simple-Model and Incremental-Value Tests

Within each anchor, any model claiming multidimensional integration must continue to compete with its strongest isolated components and other plausible shortcut models. The same logic applies to expanded models.

Let:

$$\mathcal{P}(M)$$

denote a prespecified oriented performance or utility function for model M, defined so that larger values represent better performance under the primary evaluation criterion. Where a raw metric has a lower-is-better direction or an optimum rather than a monotonic direction, the required orientation or deviation-to-utility transformation must be specified before testing.

For anchor:

$$s \in \{ana, rum\}$$

define:

$$\Delta\mathcal{P}_{s,expanded} = \mathcal{P}\left(M^{(s)}_{expanded}\right) - \mathcal{P}\left(M^{(s)}_{core}\right)$$

Because $\mathcal{P}$ is oriented prospectively, positive differences consistently indicate improvement under the prespecified primary criterion. A numerically positive sample difference alone is not sufficient. The primary metric, uncertainty interval, inferential criterion, minimum meaningful improvement where appropriate, complexity penalty, and untouched evaluation data must all be prespecified. The compared core and expanded models must be evaluated under the same primary criterion and on the same untouched evaluation observations for that comparison. Failure of a locked expanded model is recorded as failure. Reducing, reweighting, or replacing components after inspection creates a new model and requires new independent validation. [211]

The paired architecture earns scientific value only if this same anti-rescue standard is enforced across both anchors.

Stochastic Pump: Component-Only Versus Coordination Model

The dual-anchor design also provides a direct quantitative test of whether the Stochastic Pump earns systems-level value beyond its component biology.

A component-only model for anchor s contains the retained biological measurements or their validated state-specific summaries but no explicit cross-component coordination, phase-ordering, or recovery/disengagement terms. Let $k_s \geq 1$ denote the number of prospectively retained constituent component representations entering this comparison:

$$M_{components}^{(s)} = F_s\left(\phi_1^{(s)}, \ldots, \phi_{k_s}^{(s)}\right)$$

The Pump-coordination model uses the **same underlying component information** while adding prespecified relations derived from the Pump architecture:

$$M_{pump}^{(s)} = G_s\left(\phi_1^{(s)}, \ldots, \phi_{k_s}^{(s)}, \mathcal{R}^{(s)}, \mathcal{O}^{(s)}, \mathcal{Q}^{(s)}\right)$$

where $\mathcal{R}^{(s)}$ denotes prespecified cross-component relations, $\mathcal{O}^{(s)}$ temporal or phase ordering, and $\mathcal{Q}^{(s)}$ recovery, disengagement, or restored-availability structure. These organizational terms must be constructed from the same eligible constituent measurements supplied to the component-only comparison; they are not additional biological measurement families.

These equations define a prospective model class only. They do not assert that the required coordination relations have already been empirically demonstrated.

The distinction is substantive. A network change, autonomic change, or complexity change is a **component-level prediction**. A reproducible relation in which readiness, recruitment, state-specific perturbation or persistence, cross-component coordination, and restoration or reorganized availability unfold in a constrained temporal structure is a **Pump-level coordination prediction**.

For anesthesia, the Pump-level model predicts that component changes across induction, suppressive reorganization, emergence, and recovery are phase-related rather than an arbitrary collection of effects, while allowing asynchronous recovery and agent-specific implementation.

For rumination, the Pump-level model predicts that recruitment, sustained perseverative organization, disengagement, and recovery possess a reproducible coordination structure that can distinguish the state from focused practical attention, generic negative affect, or internal attention alone.

The Pump earns additional support only if the coordination model provides reproducible incremental performance beyond the component-only model after accounting for its greater complexity:

$$\Delta\mathcal{P}_{pump,s} = \mathcal{P}\left(M^{(s)}_{pump}\right) - \mathcal{P}\left(M^{(s)}_{components}\right)$$

Support requires that $\Delta\mathcal{P}_{pump,s}$ satisfy the prespecified performance and inferential criterion after appropriate complexity penalty on the same untouched evaluation observations and under the same oriented performance function $\mathcal{P}$; merely obtaining a numerically positive difference is insufficient. [211]

The stronger Pump test is cross-anchor. The systems-level principle:

$$\begin{gathered}\text{readiness} \\ \rightarrow \\ \text{controlled recruitment or perturbation} \\ \rightarrow \\ \text{coordinated transformation or persistence} \\ \rightarrow \\ \text{containment or resolution} \\ \rightarrow \\ \text{restored or reorganized availability}\end{gathered}$$

must retain the same theoretical meaning across anesthesia suppression/emergence and rumination persistence/disengagement. State-specific implementations may differ, but the coordination principle cannot be semantically rewritten after either result.

If the component models succeed while the coordination terms add no reproducible independent value, the biological components may remain valid while the Stochastic Pump is weakened as a distinct systems-level construct. If Pump-like coordination appears within each anchor but requires a different theoretical meaning in the two conditions, the cross-anchor Pump claim fails.

Relationship to the Mapping Theorem

The paired-anchor models test the empirical measurement side of the architecture, not the identity proposition directly. The two mappings remain distinct.

The ontological proposition is:

$$B_{event} \leftrightarrow P_{primary}$$

where the complete bounded organism-relative biological event and primary phenomenology are proposed as two characterizations of one occurrence.

The measurement mapping is:

$$X^{(s)} \rightarrow \phi^{(s)} \rightarrow M^{(s)}$$

where selected third-person biological observations are converted into an operational representation and tested prospectively.

The paired anchors constrain whether that measurement architecture can remain coherent across two markedly different perturbational regimes. The measurement distinction remains:

$$FS \neq P_{primary}$$

They also do not convert successful biological state classification into strict identity proof. The identity-level conditional entailments and their falsification logic are addressed in the subsequent validation architecture.

The architectural significance of the pair is therefore conditional but substantial. If invariant constructs, prospective transformations, dissociation controls, holdouts, simpler-model challenges, and the Pump coordination test all survive, the biological side of the proposed mapping becomes more tightly constrained. If they do not, the location of failure must remain explicit rather than being absorbed by post hoc reinterpretation.

Paired Failure and Anti-Rescue Logic

The established failure hierarchy remains:

1. observed-measure failure;
2. expanded-component failure;
3. anchor-core failure;
4. complete-anchor failure;
5. paired-architecture failure;
6. general Mapping-strategy failure.

Here **complete-anchor failure** means failure of the prospectively declared full anchor model under adequate measurement; it does not mean that the complete bounded biological event has been falsified or exhaustively measured. Level 5 is specifically the shared paired architecture. It is not synonymous with failure of both anchors. It includes failure of construct invariance, incompatible shared-variable meanings, opportunistic transformation changes, unequal validation standards, anchor-specific exceptions introduced only after failure, or a requirement to reinterpret the domains to protect the pair.

A general Mapping-strategy failure is a more demanding conclusion because the proposed mapped unit is the complete bounded organism-relative biological event rather than the coarse psychological labels “anesthesia” or “rumination.” Before a Level-6 conclusion is justified, failures of state definition, endpoint homology, agent or context separation, measurement validity, predictor–criterion separation, and cross-anchor invariance must first be localized.

The anti-rescue sequence is therefore:

$$\begin{gathered}\text{locked paired model}\\ \rightarrow\\ \text{independent tests}\\ \rightarrow\\ \text{result}\\ \rightarrow\\ \text{pass, partial support, or failure}\\ \rightarrow\\ \text{documented new model if revised}\\ \rightarrow\\ \text{new independent validation}\end{gathered}$$

A failed paired model remains failed. [211]

Present Scientific Status

Existing evidence provides component-level empirical support relevant to both anchors, but there is no completed prospective paired-anchor validation. The six proposed Friction Signature labels have not yet been shown to possess invariant meanings across anesthesia and rumination, and some—particularly recursive/access, metabolic, dynamical, and temporal domains—remain incomplete or unresolved as genuinely shared biological constructs. Accordingly, the current paired test concerns only those domains actually retained as shared in prospectively declared anchor models; unmeasured or anchor-specific domains do not cast a positive paired-invariance vote. [12, 13, 21, 38–40, 50, 75, 212–235]

The strongest current paired claim is therefore not that one common state-space has already been demonstrated. It is that the Mapping programme specifies a falsifiable test of whether two independently defined perturbational regimes can be represented by anchor-specific biological models while preserving a restricted set of invariant constructs and common validation rules.

If both anchors survive prospective holdouts and the shared-domain and Pump-coordination invariance tests succeed without post hoc semantic revision, the paired architecture would gain substantial operational support and explanatory freedom would be reduced. If the anchors succeed individually but invariance fails, the paired architecture fails specifically while the individual anchor models may survive.

The following subsection evaluates the empirical alignment, evidential maturity, and present limitations of the candidate domains across the two anchors.

18.6 Empirical Alignment and Evidence Boundaries

Sections 18.3–18.5 define two state-specific candidate anchor models and the conditions under which they can be integrated into a constrained paired architecture. The present subsection asks a different question: how far does the existing empirical literature already support the biological components and methodological assumptions on which those models depend?

The evidence is not equally mature across components or anchors, and evidence collected during a target state is not automatically direct evidence for every theoretical construct assigned to that measurement. A BOLD signal acquired during rumination, for example, is a direct measurement obtained during the state but remains an indirect measure of metabolic demand. Likewise, behavioural unresponsiveness during anesthesia is directly observed but does not directly measure absence of phenomenology. The relevant evidential hierarchy must therefore distinguish state-level observation from construct validity. [75, 112, 118]

Five forms of support are useful. **Direct state-level support** occurs when a proposed observable is measured during the target condition and compared with an appropriate reference. **Convergent support** occurs when distinct methods implicate a related theoretical construct while remaining non-interchangeable measurements. **Indirect support** occurs when a proxy is used for a target construct that is not itself directly measured. **Conditional support** applies when a relation depends strongly on agent, dose, task, population, state definition, physiology, or measurement method. **Emerging support** applies where results remain limited, heterogeneous, weakly replicated, or not yet organized around a stable construct.

These categories describe evidential maturity, not theoretical importance. A theoretically important component may remain prospective. Conversely, theoretical importance cannot preserve a component that repeatedly fails reliability, construct validity, incremental performance, or generalization.

The controlling evidence ladder for Section 18 is therefore:

$$\begin{gathered}\text{component-level empirical support} \\ \neq \\ \text{candidate anchor model} \\ \neq \\ \text{validated anchor model} \\ \neq \\ \text{validated paired architecture}\end{gathered}$$

Current literature reaches the first level strongly for several anesthesia components and more heterogeneously for rumination-related components. It does not yet validate either prospectively declared full anchor model or the paired architecture.

Anesthesia: Component-Level Empirical Alignment

The anesthesia literature provides the more mature biological component evidence of the two anchors. Network organization, perturbational or signal complexity, structured state-transition dynamics, and direct metabolic measurements each have substantial empirical support, while their precise relation to the target state remains agent-, endpoint-, and method-dependent.

Network Organization

Large-scale network organization is one of the strongest lower-anchor components. Propofol studies have reported altered corticocortical, thalamocortical, frontoparietal, and other large-scale interactions across reduced responsiveness and related suppressive states. Functional-integration and effective-connectivity studies likewise support anesthesia-related changes in distributed interaction rather than a simple reduction of all neural activity. [212] [38] [236] [213]

More recent human thalamic work further supports reorganization rather than a purely scalar decrease. Propofol has been reported to disrupt the functional core–matrix architecture of the thalamus, providing a more specific example of altered large-scale organizational geometry. [237]

These findings justify retaining network organization as a major candidate biological component. They do **not** justify the confirmatory rule:

$$\text{all connectivity decreases}$$

nor the broader disjunction that any degradation, uncoupling, simplification, or reorganization counts as success. Each confirmatory agent and regime requires a frozen network target before independent validation.

Neural and Perturbational Complexity

Perturbational and signal-complexity evidence is also substantial but construct-specific. Perturbational Complexity Index and related TMS-EEG work show that several suppressive states can be associated with less spatially distributed and less differentiated cortical responses than ordinary wakefulness. [215]

The propofol/xenon versus ketamine comparison provides an especially important boundary. Propofol- and xenon-induced unresponsiveness have been associated with low perturbational complexity and absence of later experiential reports, whereas ketamine-induced unresponsiveness can preserve wakefulness-like complex cortical responses and be followed by vivid dream-like experience. [39]

This evidence supports agent-specific complexity predictions and strongly rejects:

$$\begin{gathered}\text{behavioural unresponsiveness} \\ \Rightarrow \\ \text{one universal complexity profile}\end{gathered}$$

It also prevents neural complexity from being treated as a universal scalar of phenomenological quantity. The relevant evidence concerns perturbational or signal complexity, not thermodynamic entropy production.

Temporal Organization and State Trajectories

Anesthesia provides strong evidence that induction and recovery are temporally structured processes rather than instantaneous binary switches. Propofol studies have identified graded electrophysiological and behavioural changes across induction and emergence. [50] Emergence may pass through transient cortical states before behavioural awakening. [216] Recovery of consciousness and cognition can also unfold through differentiated trajectories rather than as a single simultaneous restoration. [40]

These studies strongly support the use of a multivariate anesthesia trajectory. They do not identify one universal phenomenal recovery time, and their different behavioural, electrophysiological, cognitive, and report endpoints must not be merged into a synthetic latency.

They also do not by themselves validate every possible $T^{(ana)}$ component. The biological temporal variable remains narrower than the complete trajectory:

$$\begin{gathered}\text{within-window biological temporal feature} \\ \neq \\ \text{complete anesthesia trajectory}\end{gathered}$$

A confirmatory $T^{(ana)}$ term therefore requires a specific biological dwell, recurrence, transition, stability, or recovery feature defined independently of the full sequence.

Recursive Access, Behaviour, Memory, and Report

Anesthesia research provides substantial evidence that behavioural responsiveness, command following, later report, memory, recall, and connectedness can dissociate. The distinction between unresponsiveness, unconsciousness, connected consciousness, and disconnected consciousness is therefore essential. [75] Experimental sedation work also documents subjective experiences following both responsive and unresponsive conditions, while remaining specific to the studied sedation paradigms. [217]

These findings support tracking access-related and report-related outcomes, but they do not support placing those outcomes inside the confirmatory biological predictor when they also define or evaluate the state. The current lower-anchor architecture therefore treats these variables as downstream or state-characterization measures unless a criterion-independent biological estimator of recursive/access organization is developed.

The empirical boundary remains:

$$\begin{gathered}\text{behavioural unresponsiveness} \\ \nRightarrow \\ \text{absence of primary phenomenology}\end{gathered}$$

Metabolic and Energetic Organization

Anesthesia offers unusually direct access to an energetic dimension because cerebral metabolism has been measured with PET and related techniques. Propofol has been associated with substantial regional and global changes in cerebral glucose metabolism. [218]

Comparative work demonstrates that this evidence is highly agent-specific. Dexmedetomidine, propofol, sevoflurane, and S-ketamine produced different regional and whole-brain metabolic profiles at equi-sedative target doses. [220]

Kantonen and colleagues further distinguished widespread drug-exposure-related metabolic effects from more limited effects associated with behavioural state or connectedness, again with S-ketamine providing an important boundary. [221]

The literature therefore strongly rejects:

$$\begin{gathered}\text{global metabolic suppression} \\ = \\ \text{absence of phenomenology}\end{gathered}$$

Direct metabolic measurement remains valuable, but a confirmatory metabolic prediction must specify agent, region, depth, measurement method, and expected profile before validation. A broad family such as “suppressed, redistributed, reorganized, or altered” is development-level language, not a locked prediction.

Autonomic and Regulatory Organization

Anesthesia can measurably alter autonomic and cardiovascular organization, including heart-rate variability and related vagal, sympathetic, respiratory, vasomotor, and baroreceptor-linked dynamics; surgical nociception and analgesia can further alter HRV during propofol anesthesia. These findings support an acute **autonomic/regulatory** domain, not generic allostatic load.

Interpretation is sensitive to the anesthetic and analgesic regimen, respiratory and ventilation conditions, participant characteristics and cardiovascular comorbidity, nociceptive or surgical stimulation, and recording or analysis methodology. [222] [223] [224]

The autonomic component is therefore measurable and biologically relevant but presently less specific than the strongest lower-anchor biological components. Its value must be demonstrated through a prespecified profile and incremental independent performance rather than inferred from the mere existence of autonomic change.

Rumination and Perseverative Cognition: Empirical Alignment

The rumination literature supports the psychological reality and temporal persistence of the state, relevant neural-network organization, and multi-system physiological concomitants. The biological predictor evidence is nevertheless less mature than the anesthesia evidence because state-defining variables, indirect hemodynamic measures, trait/state heterogeneity, and cross-population generalization impose stronger construct-validity constraints.

Rumination as an Independently Characterized State

Rumination is well established as repetitive, often self-focused processing concerning distress, its causes, meanings, consequences, or implications, and is associated with impaired problem solving and interference with instrumental behaviour. [227]

Experimental induction, state ratings, brooding measures, repetitive-negative-thinking measures, and thought sampling can help characterize the target state. These variables are important for criterion construction but are not independent biological predictors merely because they can be quantified.

The controlling architecture is:

$$\begin{gathered}\text{independent rumination criterion}\\ \rightarrow\\ \text{biological predictor}\\ \rightarrow\\ \text{downstream/report variables}\end{gathered}$$

Accordingly, the literature supports the rumination construct and its persistence, but it does not validate the earlier biological $R/T/N$ core simply because R and psychological persistence are strongly associated with rumination. Their use inside a biological predictor would be partly true by construction.

Network Organization

Neural-network organization is presently the clearest biological upper-anchor component. Meta-analysis has implicated default-mode-network core regions and the dorsomedial prefrontal subsystem in rumination. [228] Depressive-rumination literature also implicates altered relationships between default-mode and subgenual prefrontal regions, although those findings remain tied to major-depressive-disorder contexts rather than representing a generic induced-state biomarker. [229] Broader perseverative-cognition meta-analysis implicates medial frontal, cingulate, insular, and posterior-cingulate systems across rumination and worry. [21]

Induced-rumination studies also support state-level neural recruitment. [231]

The evidence therefore supports organized network involvement but not:

$$\begin{gathered}\text{default-mode-network activity}\\ =\\ \text{rumination}\end{gathered}$$

A final network predictor requires a paradigm-specific configuration, measurement method, comparison state, allowable variability, and failure criterion fixed before holdout testing.

Biological Temporal Organization and Physiological Persistence

Rumination and worry are prominent forms of perseverative cognition. The perseverative-cognition hypothesis proposes that repetitive thought can extend stress-related physiological activation beyond the immediate external demand. [13] Meta-analysis in healthy participants has found associations across cardiovascular, autonomic, and endocrine measures, with substantial moderation by paradigm and participant characteristics. [12]

This evidence supports biological persistence and recovery as important candidates, but it is broader than rumination alone. Psychological duration, recurrence, and difficulty disengaging remain part of the state criterion and cannot automatically become a biological $T^{(rum)}$ predictor. A valid biological temporal component must instead use criterion-independent features such as

physiological recovery, biologically measured recurrence, dwell, transition probability, or lag between independently identified disengagement and biological recovery.

Cortisol evidence is similarly heterogeneous. State or post-stress rumination paradigms have generally yielded more consistent positive associations than trait or depression-related questionnaire measures. [230]

Autonomic and Regulatory Organization

The same perseverative-cognition literature supports cardiovascular, autonomic, endocrine, and recovery-related changes during sustained cognition. This is meaningful organism-level evidence, but the construct must remain **autonomic/regulatory activation and recovery**, not cumulative allostatic load unless a genuine multisystem allostatic-load index is separately measured.

The observed physiology is not uniquely specific to rumination. A confirmatory design must therefore challenge plausible alternative explanations and physiological influences—including negative affect, generic arousal, stressor intensity, respiration, medication, clinical status, and baseline physiology—rather than attributing overlapping autonomic changes to rumination by default. A rumination-specific autonomic component earns value only if it contributes beyond those alternatives in matched prospective comparisons.

Metabolic and Hemodynamic Evidence

The current rumination literature provides substantial BOLD, connectivity, and other hemodynamic evidence but much less direct metabolic evidence. BOLD does not directly measure glucose utilization, cerebral oxygen consumption, ATP turnover, heat production, lactate flux, or total dissipative cost. [42, 112, 118]

Accordingly:

$$M_{direct}^{(rum)} = [\text{NDR}]$$

for direct state-rumination metabolic quantification using glucose utilization, $CMRO_2$, ATP-related measures, calorimetry, or comparable direct energetic methods.

This boundary is particularly important to the broader Friction Signature programme. Neural or hemodynamic recruitment may motivate future direct metabolic testing, but current BOLD findings cannot be converted into a measured thermodynamic cost without additional data and modelling.

Dynamical Organization

Rumination-related dynamical evidence is promising but remains heterogeneous. Chen and Yan reported a specific induced-state pattern in healthy participants: hypostability within the default-mode network and hyperstability within the frontoparietal-control network during continuous rumination relative to distraction. [232]

Kim and colleagues developed a dynamic resting-state connectivity model associated with trait/depressive-rumination questionnaire scores across subclinical datasets, but predictive effects were modest and clinical generalization incomplete. [233]

A preregistered adolescent study subsequently found that the adult dynamic-rumination model did not generalize to 443 adolescents; newly developed linear models also failed held-out generalization, and an exploratory nonlinear model failed external generalization. [234]

Resting-state EEG work in major depressive disorder has additionally associated rumination with altered spatiotemporal complexity, but this is not an induced state-rumination experiment in healthy participants. [235]

The strongest current interpretation is therefore not a universal increase or decrease in “complexity.” The evidence concerns dynamical stability, flexibility, recurrence, switching, dwell, connectivity, and in some studies signal complexity. Whether these constitute one coherent cross-anchor C domain remains unresolved.

Cross-Anchor Empirical Alignment

At the component level, the two anchor literatures show meaningful but asymmetric alignment. Anesthesia research provides substantial evidence for network reorganization, perturbational or signal-complexity changes, structured induction/emergence trajectories, direct metabolic effects, and acute autonomic regulation. Rumination and perseverative-cognition research provides strong evidence for the psychological target, network involvement, temporal persistence, and physiological concomitants, together with more limited or heterogeneous evidence for dynamical organization; direct state-rumination metabolic quantification remains [NDR] within the audited literature.

This is scientifically useful because neither anchor is adequately described by one generic measure such as global activity, metabolism, connectivity, or complexity. It also demonstrates why empirical maturity must remain component-specific.

What the literature has **not** yet demonstrated is the decisive paired claim from Section 18.5. No harmonized prospective programme has established that the proposed domain meanings remain invariant across anesthesia and rumination. The controlling rule therefore remains:

$$\text{same domain label} \neq \text{same latent construct}$$

Current evidence supplies **convergent component-level alignment, not completed paired-anchor validation**. Direct evidence for cross-anchor invariance can come only from domains prospectively retained in both relevant anchor-specific models under the same frozen theoretical meaning; unmeasured or anchor-specific domains do not cast a positive paired-invariance vote.

The present paired representation must accordingly remain two anchor-specific operational spaces linked by a candidate invariant-domain dictionary. A common metric state-space, common coordinate geometry, and cross-anchor measurement invariance remain prospective.

Primary Evidence Boundaries

Several boundaries govern interpretation of the literature.

Anesthesia endpoints are not interchangeable. Behavioural loss of responsiveness, connectedness, disconnected experience, later recall, perturbational complexity, cognitive recovery, and inferred consciousness status refer to different experimental outcomes. Their timings and effects cannot be merged retrospectively into one generic endpoint.

Rumination constructs are likewise heterogeneous. Induced state rumination, trait rumination, depressive rumination, brooding, worry, and broader repetitive negative thought overlap but are not identical. Results must remain tied to the construct actually measured.

Agent and population specificity are substantial. Propofol-like results cannot be assumed to generalize to ketamine, xenon, dexmedetomidine, sevoflurane, or other agents without prospective testing. Findings in healthy volunteers, major depressive disorder, remitted depression, surgical populations, experimentally sedated participants, adults, and adolescents likewise represent distinct transportability challenges.

Measurement modalities do not provide interchangeable units. Functional connectivity, effective connectivity, BOLD, PET glucose metabolism, PCI, Lempel-Ziv complexity, permutation entropy, HRV, cortisol, and other measures estimate different biological properties. Cross-method convergence must be demonstrated at the level of a validated construct rather than assumed from common direction or common numerical scaling. [12, 38, 42, 54, 112, 118, 120, 121]

Several proposed components remain latent or constructed. Recursive/access variables and state-defining persistence cannot be treated as directly observed biological quantities merely because they can be scored. Predictor–criterion separation must remain explicit. [211]

Most existing evidence establishes association, dependence, or manipulation-related state change rather than causal necessity, sufficiency, or identity. Anesthetic exposure causally alters a broad biological system, but an associated network or metabolic change is not thereby established as the cause of connectedness or its loss. Induced rumination can alter neural and physiological measures without establishing that one measured change causes perseverative persistence. [39, 75, 217, 221, 231, 232]

Multicollinearity is another unresolved problem. Network organization, dynamical measures, biological temporal features, autonomic regulation, and metabolism may share substantial variance. Multidimensionality earns value only if retained components contribute reliable information beyond simpler alternatives. [211]

Temporal alignment also requires care. Measurements integrated over seconds, minutes, or delayed interviews cannot be treated as if they represent one synchronous biological instant. Measurement windows must be aligned to the actual trajectory and endpoint being modelled.

Finally, publication bias, analytic flexibility, selective reporting, modest samples, shared datasets, similar pipelines, and limited replication remain general risks. The number of published studies cannot be equated automatically with independent evidential convergence. Group-level separation likewise does not establish reliable individual-level state tracking. [211, 238]

Consequences for Model Development

The present evidence hierarchy justifies differences in **model maturity**, not fixed numerical weights. Stronger component-level evidence may motivate a conservative core model, stronger regularization of immature terms, or a prespecified prior architecture during development. It does not empirically derive, for example:

$$\lambda_{core}^{(s)} > \lambda_{j}^{(s)}$$

or any other final coefficient relation.

Weights, transforms, thresholds, and model-selection choices must be estimated only within development or calibration data and then frozen. Validation data cannot be used to adjust an evidence-based hierarchy and then counted as confirmation. If a locked model fails and a weighting rule is changed, the revision constitutes a new model generation requiring new independent validation. [211]

The same rule applies to operational-model completeness. A component does not deserve permanent inclusion in a core, expanded, or full candidate measurement model merely because the complete biological event is expected to be multidimensional. If a term repeatedly reduces reliability, transportability, calibration, discrimination, trajectory tracking, or incremental performance, it should be revised or removed from that operational model even if the underlying biology remains theoretically relevant. Such revision changes the measurement model; it does not redefine the complete bounded biological event.

Empirical Criteria for Advancement

The programme moves beyond component-level alignment only through staged prospective testing:

$$\begin{gathered}\text{development/calibration} \\ \rightarrow \\ \text{manipulation, agent, or task holdout} \\ \rightarrow \\ \text{participant holdout} \\ \rightarrow \\ \text{external replication or transportability}\end{gathered}$$

Advancement requires independently defined target states; frozen component constructions, transforms, weights, thresholds, comparison conditions, and time windows; successful discrimination and calibration on untouched data; reproducible trajectory tracking; resistance to the strongest single-component and shortcut models; and incremental performance of expanded models where those expanded terms are retained. [211]

For anesthesia, generalization claims must survive appropriate agent- and endpoint-specific boundary tests rather than collapsing all unresponsive states together. For rumination, the model must distinguish sustained rumination from focused practical attention, negative affect without perseveration, ordinary mind-wandering, and other prespecified controls. Trait susceptibility must remain distinct from current state expression.

Where organism-relative tracking is claimed, within-individual trajectories are required in addition to useful group-level effects. New-participant generalization, new-manipulation generalization, new-population transport, new-laboratory replication, and new-platform replication are different evidential achievements and should be reported separately.

The paired architecture additionally requires the invariant-domain dictionary to be frozen before both anchor tests, prohibited semantic drift to remain explicit, and shared construct meanings to survive both programmes. Any direct invariance claim must be restricted to domains prospectively retained in both relevant anchor models. A model may therefore pass each anchor separately and still fail the paired architecture at Level 5 if cross-anchor construct invariance fails.

The Stochastic Pump adds a further empirical burden. Existing literature supports biological components and state-related changes; it does not yet establish that a Pump-coordination model outperforms the same components without coordination terms. The component-only versus Pump-coordination comparison defined in Section 18.5 therefore remains prospective. Pump-level support requires independent incremental performance after appropriate complexity penalty and cross-anchor preservation of the same coordination principle. [12, 13, 21, 38–40, 50, 75, 212–237]

Present Empirical Verdict

The anesthesia anchor is sufficiently grounded at the **component level** to justify prospective testing of a biological model centred on network organization, neural or perturbational complexity, and a purified biological temporal component, with direct metabolic and autonomic/regulatory measures available as additional state-specific candidates. The literature does not yet validate the combined weighted anchor equation. [38–40, 50, 75, 212–224, 236, 237]

The rumination anchor is empirically grounded as a psychological and physiological target and has meaningful biological component evidence, particularly for network organization, perseverative physiological persistence, and selected dynamical findings. Its current biological core remains prospective: $N + T_{bio}$ when a criterion-independent biological temporal component is justified, or a prospectively declared network-only core when it is not. Recursive/self-report variables and state-defining persistence must remain outside the confirmatory biological predictor, direct metabolic measurement remains NDR, and dynamical generalization remains unresolved. [12, 13, 21, 227–235]

The paired-anchor programme is therefore empirically viable as a **prospective research architecture**, but current evidence does not validate invariant meanings across the six-domain dictionary, a common active six-domain model, a common metric state-space, finalized transformations or weights, the Pump coordination advantage, complete-event necessity or sufficiency, or strict phenomenology–biology identity.

The strongest justified conclusion is:

Existing evidence provides substantial component-level support for the anesthesia anchor and convergent but more heterogeneous support for the rumination anchor, while the quantitative indices, biological upper-anchor core, Pump coordination advantage, and cross-anchor shared-domain architecture remain prospective and require locked independent validation. [12, 13, 21, 38–40, 50, 75, 212–238]

This evidence is sufficient to motivate formal prospective testing under the locked architecture. It is not completed quantitative validation.

The following subsection specifies the validation, comparison, and falsification conditions under which the candidate models, paired architecture, and associated claims can advance, fail locally, or require a new model generation.

18.7 Validation, Comparison, and Falsification

The preceding subsections defined the quantitative method, developed the anesthesia and rumination anchors, integrated them through a candidate invariant-domain architecture, and assessed the current empirical evidence. The purpose of the present subsection is to specify how those models must be tested, compared, weakened, revised, or rejected.

The objective is not merely to show that individual biological variables differ between states. Existing literature already documents many such differences. The stronger test is whether prespecified biological models can identify, distinguish, and track independently characterized target states using component definitions, transformations, weights, thresholds, temporal windows, comparison conditions, and success criteria that remain fixed during confirmatory evaluation.

A valid test must therefore separate model construction from model evaluation, preserve predictor–criterion independence, compare the proposed architecture with simpler alternatives, distinguish calibration from discrimination, and state in advance which outcomes constitute support, partial support, local failure, or a more substantial challenge.

Development, Calibration, and Holdout Architecture

The mature validation sequence is:

$$\begin{gathered}\text{development/calibration} \\ \rightarrow \\ \text{manipulation, agent, or task holdout} \\ \rightarrow \\ \text{participant holdout} \\ \rightarrow \\ \text{external replication or transportability}\end{gathered}$$

These stages test different scientific claims and must not be collapsed.

Development and calibration data may be used to estimate measurement reliability, construct candidate components, examine redundancy, select among prespecified model families, develop transformations, estimate provisional weights, define target profiles, and calibrate decision thresholds. Any supervised feature selection, dimensionality reduction, latent-variable construction, prototype generation, classifier fitting, distance-target construction, or other target-informed operation must remain entirely within development data. [211, 239, 241]

The first holdout tests whether the locked model survives a new manipulation, anesthetic agent, rumination task, or other scientifically relevant condition without changing its construct definitions or analysis rules. Participant holdout then tests

generalization to unseen individuals. External replication or transportability asks whether the frozen architecture survives new laboratories, populations, equipment, measurement platforms, or settings. [239, 241]

Before confirmatory evaluation, the complete analytic pipeline must be frozen. This includes participant inclusion and exclusion criteria, preprocessing, quality control, artefact rejection, masks or parcellations where applicable, observed variables, feature construction, component definitions, supervised component models, transformations, baselines, covariates, model family and search space, weighting rules, thresholds, primary time windows, comparison states, missing-data strategy, primary performance metric, and pass/partial/failure criteria.

The same observations must not be used simultaneously to discover the biological profile, construct the predictor, estimate its parameters, choose the most favourable analysis, and demonstrate that the model succeeds. Such a procedure establishes internal fit rather than independent predictive validity. [211, 239, 241]

A generic candidate expanded model remains:

$$S_{s,expanded}(t) = \lambda_{core}^{(s)} S_{s,core}(t) + \sum_{j=1}^{m_s} \lambda_j^{(s)} \phi_j^{(s)}(t)$$

for:

$$s \in \{ana, rum\}$$

with any non-negativity, sum-to-one, or additivity constraints treated as provisional model assumptions rather than consequences of the Mapping Theorem. Once the confirmatory model is frozen, those assumptions cannot be changed using the evaluation data and then counted as confirmation.

Prespecification

Before examining target validation data, each study must specify the target state, comparison state or states, participant population, retained biological components, observed measures used to construct those components, preprocessing and quality-control rules, component-construction procedures, state-specific transformations, weighting method, primary temporal window, missing-data strategy, statistical or classificatory model, primary performance metric, decision threshold or criterion, and weakening or failure conditions.

Exploratory analysis is permissible during model development, but it must be identified as exploratory. Any model emerging from exploration must subsequently be frozen and tested unchanged on new data.

Broad directional descriptions developed in Sections 18.3 and 18.4 are not themselves confirmatory predictions. Terms such as *suppressed*, *degraded*, *preserved*, *reorganized*, *recruited*, *persistent*, or *constrained* define development-level families unless the particular agent, paradigm, component, measurement method, comparison state, time window, expected configuration, and failure condition have been locked before testing.

Five Primary Validation Questions

The anchor programme addresses five distinct validation questions.

First, does the frozen biological model discriminate its independently defined target state from prespecified comparison states?

Second, does it track the temporal development, persistence, disengagement, emergence, resolution, or recovery of that state?

Third, does the declared core provide reproducible value beyond its strongest valid simpler comparator—its strongest individual component where the core is multidimensional, or the strongest relevant shortcut or non-biological comparator where the core is unidimensional?

Fourth, does the expanded model provide reproducible incremental performance beyond the core after accounting for additional complexity?

Fifth, does the model generalize across the specific holdout levels for which generalization is claimed?

These questions must remain separate. A model may distinguish group averages while failing to classify individuals, track within-person transitions, remain calibrated, generalize to a new manipulation, or transport across populations. [239, 240] Conversely, heterogeneous group effects do not automatically erase a reproducible within-individual trajectory when the intended scientific use is organism-relative state tracking.

Where individual-state tracking is claimed, within-individual trajectory performance is therefore essential. Group-level separation can provide evidence, but it is not a substitute for organism-relative tracking.

Independent State Definition and Predictor Separation

The target state must be operationally defined without reference to whether the biological model succeeds. The controlling order is:

$$\begin{gathered}\text{independent state criterion}\\ \rightarrow\\ \text{biological predictor}\\ \rightarrow\\ \text{downstream/report/access variables}\end{gathered}$$

For anesthesia, behavioural responsiveness may contribute to experimental state characterization, but behavioural unresponsiveness cannot be equated with absence of primary phenomenology. Responsiveness, connected experience, disconnected experience, later recall, absence of later report, memory, and cognitive recovery remain distinct endpoints. [39, 40, 75, 217]

A confirmatory anesthesia study must therefore define its target suppressive state independently of the Friction Signature predictor. Terms such as *deep suppressive anesthesia* require an explicit operational criterion based on the manipulation and relevant state measures rather than successful expression of the biological model.

For rumination, state ratings, thought sampling, behavioural persistence, disengagement measures, recurrence, or other psychological variables may contribute to defining the target state. Neural or physiological variables may also contribute to a state criterion only if they are not then recycled into the biological predictor being evaluated. Criterion and predictor variables must remain methodologically separable in the confirmatory test.

The biological model must therefore provide information beyond the labels or measurements used to identify the state. Otherwise, the model risks becoming a formal restatement of its own operational definition.

Validation of the Anesthesia Anchor

The primary lower-anchor comparison is between ordinary wakeful organization and a prespecified suppressive anesthetic condition defined independently of the biological predictor.

The multivariate trajectory remains primary:

$$\begin{gathered}\tau_{ana}\\ =\\ \Big\langle\\ \Phi_{bio}^{(ana)}(t_1),\\ \Phi_{bio}^{(ana)}(t_2),\\ \dots,\\ \Phi_{bio}^{(ana)}(t_n)\\ \Big\rangle\end{gathered}$$

and may span wakefulness, induction, specified suppression, emergence, and recovery. Behavioural loss of responsiveness may be marked as an experimental event, but it is not assumed to define phenomenal absence or to serve as a universal biological phase boundary.

If a scalar anesthesia summary is retained, an ordering such as:

$$S_{ana}(wakeful)$$
$$<$$
$$S_{ana}(prespecified\ suppressive\ state)$$

is evidence only when the entire transformation and weighting system was frozen before the relevant holdout. The model should not be calibrated on the same observations so that this ordering becomes true by construction.

The trajectory need not be monotonic. Network, complexity, metabolic, autonomic, and biological temporal measures may change at different rates. Hysteresis, transitional states, residual drug effects, temporary dissociations, and asynchronous recovery are therefore compatible with the architecture when they are handled prospectively rather than invoked after model failure.

The lower-anchor core defined in Section 18.3 should be tested first against its strongest single biological component and other relevant simpler comparators. The expanded metabolic and autonomic/regulatory terms then earn retention only through prespecified incremental performance on untouched data. Downstream responsiveness, memory, recall, report, and connectedness remain parallel outcomes rather than biological predictor terms unless a separately validated criterion-independent biological estimator is developed.

Anesthesia Comparison Conditions

Validation against ordinary wakefulness alone is insufficient. Stronger tests should include, where endpoint homology and experimental design permit, lighter sedation, natural sleep, behaviourally unresponsive states with evidence of preserved or reorganized experience, disconnected-consciousness conditions, emergence and recovery, different anesthetic agents, motor impairment without equivalent conscious-state disruption, and pharmacological conditions with similar behavioural endpoints but different neural organization.

Agent-specific testing is essential. A model developed under propofol-like suppression cannot be assumed to classify ketamine, xenon, dexmedetomidine, sevoflurane, or another anesthetic regime without separate prospective evaluation.

Ketamine remains a particularly important boundary because behavioural unresponsiveness may coexist with preserved wakefulness-like complexity and later dream-like reports. [39] A valid state-specific model should represent that condition according to its frozen biological profile rather than force it into the same configuration as deeply suppressive propofol-like anesthesia.

Cross-agent success therefore does not require every agent to generate the same score or trajectory. It requires that any claimed invariant constructs retain the same theoretical meaning while their allowable agent-specific manifestations are specified before testing.

Anesthesia Recovery as a Reversibility Test

Recovery provides a strong within-manipulation challenge. If the model is tracking anesthesia-related suppressive organization rather than a stable participant characteristic or nonspecific measurement artefact, its biological trajectory should reorganize toward the prespecified wakeful reference during emergence and recovery.

The return need not be instantaneous, monotonic, or geometrically symmetric with induction. Hysteresis, delayed restoration, residual drug effects, transitional states, component-specific recovery rates, and temporary dissociations among biological, behavioural, and cognitive measures should be analysed explicitly. [40, 50, 216]

Persistent failure of a frozen model to track independently characterized emergence and recovery would weaken its interpretation as a state-sensitive anesthesia model. Recovery testing should therefore evaluate both state discrimination and trajectory correspondence.

Validation of the Rumination Anchor

The primary upper-anchor comparison is sustained rumination versus an independently characterized non-ruminative state. Calm rest is useful but insufficient because rest can contain spontaneous internally oriented or self-referential thought. [36, 119, 201, 228]

Focused practical attention provides a stronger framework-specific comparator. The conditions should be matched as closely as feasible for duration, cognitive effort, sensory input, motor response, general difficulty, and emotional intensity where appropriate. The purpose is to test whether the biological model distinguishes perseverative rumination from demanding but goal-directed cognition rather than merely detecting effort, internal attention, arousal, or sustained task engagement.

The rumination trajectory remains primary:

$$
\begin{gathered}
\tau_{rum} \\
= \\
\Big\langle \\
\Phi_{bio}^{(rum)}(t_1), \\
\Phi_{bio}^{(rum)}(t_2), \\
\dots, \\
\Phi_{bio}^{(rum)}(t_n) \\
\Big\rangle
\end{gathered}
$$

and may span induction or onset, sustained rumination, persistence, disengagement, and resolution.

If a scalar state-specific summary is retained, an ordering such as:

$$
\begin{gathered}
S_{rum}(\mathit{focused\ practical\ attention}) \\
< \\
S_{rum}(\mathit{sustained\ rumination})
\end{gathered}
$$

constitutes evidence only when the state criterion, biological variables, transformations, weights, and decision rule were frozen before the confirmatory comparison. It is not a theorem-level requirement and must not be engineered from the same validation observations.

The current biological core defined in Section 18.4 should be tested using criterion-independent biological variables. Network organization is presently the cleanest biological component. A biological temporal term may enter only when it is independently constructed from biological persistence, recurrence, transition, or recovery rather than from the psychological persistence used to define rumination. Recursive/self-report variables remain outside the confirmatory biological predictor.

Candidate autonomic/regulatory and dynamical additions should be retained only if they add reproducible information beyond the core. Direct metabolic terms remain future-data-dependent where direct metabolic measurements are unavailable.

Rumination Comparison Conditions

The upper anchor should distinguish sustained rumination from several partially overlapping states. Useful comparisons include calm rest, structured distraction, negative affect without perseveration, ordinary mind-wandering, focused practical attention, active problem solving, and resolved reflection without perseverative looping.

Focused practical attention is especially important because demanding problem solving may recruit control systems, increase energetic demand, and persist over time without reproducing the same perseverative organization. The relevant dissociation is therefore not simply rumination versus low-effort rest.

Negative affect also cannot serve as the only comparison because autonomic or endocrine activation may reflect emotional intensity without sustained recursive self-reference. Ordinary mind-wandering may contain internally oriented cognition without the same persistence, self-evaluative recurrence, or difficulty disengaging.

The upper anchor is strengthened only if the frozen biological model can distinguish the independently defined rumination state from these alternative explanations.

State and Trait Rumination

State and trait rumination must remain distinct:

$$
\begin{gathered}
\text{trait susceptibility} \\
\neq \\
\text{current state expression}
\end{gathered}
$$

Trait measures may characterize susceptibility, baseline variation, probability of entering a ruminative state, expected duration, recurrence, or difficulty disengaging. They do not substitute for direct measurement of the active state. [227, 233, 234]

A robust state model may therefore require repeated measurements, ecological momentary assessment, experimental induction, longitudinal observation, and time-resolved neural or physiological data. Generalization from a trait model to an active state model is a separate empirical achievement and must not be assumed.

Rumination Disengagement as a Reversibility Test

The upper anchor also contains a reversibility or disengagement prediction. If the model is sensitive to active perseverative organization, independently verified disengagement, attentional redirection, or resolution should be accompanied by a reproducible biological reorganization toward the relevant comparison state.

That recovery need not be synchronous. Autonomic or endocrine recovery may lag behind cognitive disengagement; network, hemodynamic, and dynamical measures may reorganize at different rates; and subjective resolution may precede or follow physiological normalization.

These lags are part of the trajectory and should be modelled rather than averaged away. Persistent failure of the frozen biological model to change when independently verified rumination disengages or resolves would weaken its interpretation as a state-sensitive rumination model.

Core Versus Expanded Model Comparison

For both anchors, the declared core model is the primary benchmark. The anesthesia core and an $N + T_{bio}$ rumination core are multidimensional, whereas the prospectively declared network-only rumination core permitted by Section 18.4 is unidimensional. The expanded model is not presumed superior merely because it includes more biological dimensions.

Let:

$$\mathcal{P}(M)$$

denote a prespecified oriented performance or utility function for model M, defined so that larger values represent better performance under the primary evaluation criterion. Where a raw metric has a lower-is-better direction or an optimum rather than a monotonic direction, the corresponding orientation or deviation-to-utility transformation must be specified before testing. Here, $M_{core}^{(s)}$ and $M_{expandcd}^{(s)}$ denote the evaluated model objects corresponding to the core and expanded score constructions. The incremental performance of an expanded model may be represented as:

$$\Delta \mathcal{P}_{s,expanded} = \mathcal{P}\left(M_{expanded}^{(s)}\right) - \mathcal{P}\left(M_{core}^{(s)}\right)$$

Because $\mathcal{P}$ is defined as an oriented performance or utility function, positive differences consistently indicate improvement under the prespecified primary criterion.

A numerically positive sample difference is not sufficient. The primary metric, uncertainty interval, inferential criterion, minimum meaningful improvement where appropriate, complexity penalty, and evaluation dataset must be specified before the confirmatory comparison. The core and expanded models must be evaluated under the same oriented performance definition and on the same untouched evaluation observations for that comparison.

Relevant primary outcomes may include discrimination, calibration, temporal tracking, transition prediction, cross-dataset generalization, or individual-level classification. Biological interpretability may remain a valuable secondary scientific outcome, but it cannot rescue an expanded model that fails its prespecified primary empirical criterion.

If the locked expanded model performs no better than the core, that failure must be recorded. The added components may remain biologically informative, but they have not earned status as necessary components of the predictive index in that model generation. Revising the component set, transformations, weights, or other analytic choices after that result creates a new model that requires new independent validation.

Strongest-Single-Component and Simpler-Model Comparison

Any Friction Signature model claiming multidimensional integration must earn that added complexity rather than assume that additional dimensions improve prediction. Each anchor should therefore be compared prospectively with the strongest plausible simpler alternatives.

For anesthesia, comparator models may include Perturbational Complexity Index alone, one prespecified network measure, one spectral or signal-complexity measure, one direct metabolic marker, behavioural responsiveness alone, drug concentration alone, or another prospectively declared simpler or restricted biological model appropriate to the tested regime.

For rumination, valid simpler predictor comparators may include one prespecified network measure, default-mode activity alone, one autonomic or regulatory measure, one dynamic-connectivity measure, negative affect alone, or another prospectively declared simpler or restricted biological model, provided the comparator does not participate in defining the target state. A state-rumination criterion may be reported separately as a criterion-only or shortcut benchmark, but a state-rumination score used to define the target state is not an independent predictor of that same criterion and must not enter the biological predictor being tested. The same restriction applies to any simpler comparator that directly participates in defining the target state, including behavioural responsiveness where it forms part of an anesthesia state criterion.

Let:

$$M_{simple,best}^{(s)}$$

denote the strongest prespecified simpler comparator for anchor:

$$s \in \{ana, rum\}$$

and let:

$$\mathcal{P}(M)$$

denote the same prespecified oriented performance or utility function. The incremental performance of the core may then be represented as:

$$\Delta\mathcal{P}_{s,core} = \mathcal{P}\left(M_{core}^{(s)}\right) - \mathcal{P}\left(M_{simple,best}^{(s)}\right)$$

The core earns incremental support over the prespecified simpler comparator only if the criterion for improvement is satisfied on untouched evaluation data. A positive sample difference alone is insufficient. The uncertainty interval, inferential rule, minimum meaningful improvement where appropriate, and any complexity penalty must be declared before testing. The compared models must use the same oriented performance definition and the same untouched evaluation observations.

Likewise, where an expanded model is proposed:

$$\Delta\mathcal{P}_{s,expanded} = \mathcal{P}\left(M^{(s)}_{expanded}\right) - \mathcal{P}\left(M^{(s)}_{core}\right)$$

must satisfy its own prespecified independent criterion.

A multidimensional model that fails to outperform or otherwise demonstrate a clear reproducible advantage over its strongest simpler comparator may still provide a useful descriptive summary. It has not, however, demonstrated incremental predictive value from Friction Signature integration.

Performance Evaluation

No single statistical metric is appropriate for every design. Evaluation must follow the stated scientific objective: categorical state classification, continuous state estimation, temporal tracking, transition prediction, recovery modelling, recurrence prediction, or another prospectively defined target.

Classification studies may report sensitivity, specificity, balanced accuracy, area under the receiver-operating-characteristic curve, precision, recall, predictive values, and threshold-dependent error rates. Continuous models may report explained variance, prediction error, calibration slope or intercept, correspondence with independently characterized state intensity, and separate within- and between-participant performance. Trajectory studies may evaluate onset or transition timing, temporal correspondence, lag structure, recovery or disengagement slopes, recurrence, hysteresis, component-specific return toward reference states, and prediction of state transition or resolution.

The primary metric must be specified before confirmatory testing. Secondary analyses can provide useful scientific context, but they cannot obscure failure on the preregistered primary criterion. [239, 240]

Discrimination and calibration must remain separate. A model can distinguish states while assigning poorly calibrated probabilities or scores. Conversely, population-level calibration can coexist with failure to track individual state transitions. Neither result should be represented as the other. [240]

Group-Level and Within-Individual Validation

Group-level separation can provide evidence, but it is not intrinsically required for every organism-relative claim and is not sufficient for individual state tracking. Heterogeneous responses may attenuate a group mean even when reproducible within-individual transitions remain present; conversely, a large group-average effect may coexist with substantial overlap and poor person-level classification.

Validation should therefore distinguish:

$$\text{between-group discrimination}$$

from:

$$\text{within-individual state tracking}$$

Where the stated scientific use is organism-relative state tracking, reproducible within-individual trajectories are essential. A strong design obtains repeated baseline and target-state observations from the same participants while also testing whether the frozen model generalizes to participants not used for development.

The strongest evidence would combine useful population-level performance with:

$$\text{within-individual trajectory correspondence}$$

without assuming that one necessarily guarantees the other.

External Evaluation, Transportability, and Cross-Method Construct Validity

Internal cross-validation is useful for model development and internal validation when every target-informed operation is contained within the resampling procedure, but it does not substitute for a final untouched holdout or for external evaluation. The staged programme should distinguish unseen-participant holdout evaluation from broader transportability across laboratories, populations, tasks, equipment, and measurement platforms. [239, 241]

Alternative preprocessing of the **same observations** is a robustness or sensitivity analysis, not an external validation dataset. External evaluation requires participant data or datasets not used for model development or tuning. Transportability is progressively tested as the frozen architecture encounters new experimental settings, populations, instruments, and laboratories.

Cross-method validation does not require numerical equivalence among instruments. It requires construct continuity.

For example:

$$\begin{gathered}\text{functional connectivity} \\ \neq \\ \text{effective connectivity}\end{gathered}$$

$$PCI \neq \text{Lempel-Ziv complexity},$$

$$PCI \neq \text{permutation entropy},$$

$$\text{Lempel-Ziv complexity} \neq \text{permutation entropy}$$

and:

$$\begin{gathered}HRV \\ \neq \\ cortisol\end{gathered}$$

BOLD likewise is not numerically or conceptually equivalent to direct glucose metabolism. [42, 112, 118, 218–221]

Different measurement families may converge on a broader theoretical construct only if the invariant construct definition, admissible measurement families, method-specific measurement models, expected convergence criterion, and failure criterion are specified prospectively. Numerical agreement is unnecessary; semantic and construct validity are mandatory.

HRV and cortisol illustrate the point particularly clearly. HRV primarily indexes aspects of autonomic regulation, whereas cortisol indexes endocrine/HPA-axis physiology. [12, 13, 120, 222–224] They may contribute to a broader regulatory model only under an explicitly justified construct; they cannot be treated as two interchangeable readings of one generic “autonomic load” variable.

Missing Data and Reduced Models

Missing measurements are neither confirming nor neutral by default. They must not be assigned favourable, average, or fabricated values merely to complete the Friction Signature representation.

Prespecified statistically appropriate imputation may be legitimate in some settings, but the missing-data mechanism, imputation model, deployment rule, and evaluation strategy must themselves be developed without holdout leakage and assessed prospectively. [241]

Where one or more dimensions required by an already declared model are unavailable, the resulting implementation is a **reduced model**. A deliberately prospectively declared core or restricted anchor model is not a reduced model merely because it omits domains that were never required by that model. A reduced model must be identified explicitly, its admissible component set must be prespecified where possible, and it requires its own calibration and validation.

For a declared non-negative-weight scalar model, let Ω_s denote the set of required model components actually available in a reduced implementation. A generic available-component renormalization such as:

$$S_s^{available}(t) = \frac{\sum_{i \in \Omega_s} w_i^{(s)} \phi_i^{(s)}(t)}{\sum_{i \in \Omega_s} w_i^{(s)}}$$

provided that:

$$\sum_{i \in \Omega_s} w_i^{(s)} > 0$$

does not automatically preserve the meaning of the declared full model. Changing:

$$\Omega_s$$

changes the reduced implementation. Scores derived from different component sets are therefore not automatically comparable, and a component regarded as essential to a particular hypothesis cannot be silently omitted while the resulting score is still described as the declared full model. The symbol Ω_s is used here only for available-component membership in a missing-data or otherwise incomplete implementation; it does not redefine the prospectively declared component membership of the anchor model itself.

A dataset containing only network and complexity measures may test those components or a separately validated reduced anesthesia model. It cannot independently validate the full Friction Signature architecture.

Robustness and Sensitivity Analysis

Sensitivity analysis asks whether the conclusion from the locked primary model is stable under reasonable alternative assumptions. It does not provide a search procedure for rescuing a failed confirmatory result.

Reasonable sensitivity analyses may examine alternative baseline windows, prespecified transformation families, weighting constraints, outlier rules, temporal resolutions, preprocessing decisions, measurement-window alignment, missing-data assumptions, and plausible hyperparameters.

The primary result remains the result of the locked analysis. [211, 238, 241] If an alternative preprocessing rule, transform, weighting constraint, component set, or hyperparameter becomes preferred **after** the evaluation data have been inspected, that alternative constitutes a new model generation:

$$\text{locked model} \rightarrow \text{independent test} \rightarrow \text{result} \rightarrow \text{new model if revised} \rightarrow \text{new independent validation}$$

A failed locked model remains failed.

Confounding, Predictive Shortcuts, and Alternative Explanations

Validation must determine whether a model identifies the intended state rather than a correlated but scientifically simpler variable.

For anesthesia, relevant alternatives include drug concentration, cardiovascular depression, respiratory change, mechanical ventilation, neuromuscular blockade, analgesia, nociception, sensory disconnection, motor incapacity, residual drug effects, age, and clinical status. [39, 75, 217, 220–224]

For rumination, relevant alternatives include negative affect, general arousal, depression severity, anxiety, cognitive difficulty, fatigue, ordinary mind-wandering, generic internal attention, task duration, medication, and trait susceptibility. [12, 13, 21, 227–235]

These variables can play different methodological roles. Some are confounds requiring matching, adjustment, stratification, or causal interpretation. Others are predictive shortcuts that should be tested directly as simpler comparator models. Confound control and shortcut-model competition are related but not identical analyses.

The anchor architecture is strengthened when the frozen biological model retains prespecified performance after major alternatives are addressed. It is weakened when apparent success is fully explained by a simpler predictor such as:

$$\text{motor unresponsiveness}$$

$$\text{drug concentration}$$

$$\text{general emotional arousal}$$

or:

$$\text{task difficulty}$$

Validation of the Paired-Anchor Architecture

Separate success of the anesthesia and rumination anchors is necessary for the intended paired programme but is not sufficient to validate the paired architecture.

The paired architecture is presently represented as:

$$\mathcal{T}_{anchors} = \langle \tau_{ana}, \tau_{rum} \rangle$$

where the anchors occupy two independently sampled operational spaces linked by a candidate invariant-domain dictionary. Consistent with Sections 18.3–18.5, their prospectively declared component memberships and dimensionalities may differ. The ordered pair is a bookkeeping representation, not a concatenated vector or common metric object. This notation does not imply common time, common units, direct numerical distance between the complete anchor trajectories, or a validated shared metric state-space.

Paired validation requires that theoretical meanings frozen before testing survive both anchors. For each domain prospectively retained as shared in both relevant anchor models, the invariant definition, allowed state-specific manifestations, prohibited semantic changes, admissible measurement families, construct-validity criterion, and failure criterion must remain fixed. A domain retained in only one anchor, or unmeasured in the other, cannot by itself cast a positive cross-anchor invariance vote.

Both anchors must also use the same methodological standards: independent state criteria, predictor–criterion separation, prespecified transformations, staged holdouts, strongest-simple-model comparison, core-versus-expanded testing, fixed primary metrics, and the same anti-rescue rule.

The paired architecture gains support only if the individual anchors perform adequately **and** the shared constructs remain invariant. It is weakened if success requires unrelated domains, incompatible shared-variable meanings, opportunistic transformation changes, post hoc state labels, unequal validation standards, or separate ad hoc mechanisms introduced only after failure.

The controlling paired rule is:

$$\text{anesthesia anchor success}$$
$$\wedge$$
$$\text{rumination anchor success}$$
$$\not\Rightarrow$$
$$\text{paired-architecture success}$$

A Level-5 paired failure can occur even when both anchors remain individually useful.

Validation of the Stochastic Pump Coordination Claim

The Stochastic Pump faces an additional model-comparison test. Component-level success does not establish that a systems-level coordination construct adds independent value.

For anchor:

$$s \in \{ana, rum\}$$

the Section 18.5 component-only model is:

$$M_{components}^{(s)} = F_s\left(\phi_1^{(s)}, \ldots, \phi_{k_s}^{(s)}\right)$$

and the Pump-coordination model is:

$$M_{pump}^{(s)} = G_s\left(\phi_1^{(s)}, \ldots, \phi_{k_s}^{(s)}, \mathcal{R}^{(s)}, \mathcal{O}^{(s)}, \mathcal{Q}^{(s)}\right)$$

where the additional terms encode prespecified cross-component relations, temporal or phase ordering, and recovery, disengagement, or restored-availability structure.

The Pump earns incremental support only if:

$$\Delta\mathcal{P}_{pump,s} = \mathcal{P}\left(M^{(s)}_{pump}\right) - \mathcal{P}\left(M^{(s)}_{components}\right)$$

satisfies a prespecified independent performance criterion after appropriate penalty for additional complexity.

The stronger Pump test is cross-anchor. The systems-level meaning of readiness, controlled recruitment or perturbation, coordinated transformation or persistence, resolution, and restored or reorganized availability must remain invariant across anesthesia suppression/emergence and rumination persistence/disengagement.

If the components succeed but coordination adds no reproducible independent value, the component biology may survive while the Stochastic Pump is weakened as a distinct systems-level construct. If coordination appears within each anchor but requires different theoretical meanings, the cross-anchor Pump claim fails.

Within-Anchor State Separation

The current programme does not assume one validated common metric state-space. State separation is tested within each anchor using an anchor-specific separation statistic whose mathematical meaning is explicitly defined before evaluation.

For anesthesia:

$$d_{ana}\left(\Phi^{(ana)}_{wakeful}, \Phi^{(ana)}_{supp}\right) > \delta_{ana}$$

and for rumination:

$$d_{rum}\left(\Phi^{(rum)}_{comparison}, \Phi^{(rum)}_{rumination}\right) > \delta_{rum}$$

where:

$$d_{ana}$$

and:

$$d_{rum}$$

denote prespecified anchor-specific separation statistics appropriate to their respective models. For the inequalities above, each statistic must be oriented prospectively so that larger values indicate greater separation under the declared primary criterion. Within each anchor, the two state vectors entering the comparison must use the same locked component membership, construction rules, transformations, and measurement definitions. Their mathematical form and interpretation must be fixed before evaluation. If a classifier is used, a margin, posterior probability, or other classifier output must be converted into or evaluated through a separately defined decision statistic; these quantities are not interchangeable merely because each yields a scalar result.

Thresholds must be developed or calibrated before confirmatory evaluation, remain fixed during holdout testing, produce interpretable error rates, and demonstrate separation beyond expected within-state variation under the stated validation criterion.

A future programme may attempt a common multistate geometry only after construct invariance, compatible measurement semantics, cross-anchor calibration, and metric validity have been demonstrated. That common state-space is prospective, not assumed.

Levels of Empirical Failure

Not every failed measurement has the same theoretical consequence. Failure must be localized hierarchically.

Level 1 — Observed-measure failure. A particular HRV metric, connectivity estimator, metabolic proxy, complexity measure, or other observable may fail because it is unreliable, poorly calibrated, or poorly matched to the intended construct. This weakens that measurement choice without automatically invalidating the broader domain.

Level 2 — Expanded-component failure. An added metabolic, autonomic/regulatory, dynamical, or other expanded component may fail to provide incremental value while the core survives.

Level 3 — Anchor-core failure. A prespecified core may fail to discriminate the independently defined target state, track the expected trajectory, or outperform its strongest simpler comparator under adequate testing. This substantially weakens that state-specific operationalization.

Level 4 — Complete-anchor failure. Here *complete anchor* means the prospectively declared full anchor model, not the complete bounded biological event. Repeated failure of that full anchor model across independent, well-designed studies indicates that the present Friction Signature operationalization has not produced a viable quantitative model for that state.

Level 5 — Paired-architecture failure. The paired architecture fails when the individual anchors cannot be integrated under stable shared constructs and common validation rules. Importantly, this can occur even when both anchors succeed independently:

$$\begin{gathered}\text{anesthesia anchor passes} \\ \wedge \\ \text{rumination anchor passes} \\ \wedge \\ \text{cross-anchor construct invariance fails}\end{gathered}$$

The individual anchors may survive while the paired architecture fails.

Level 6 — General Mapping-strategy failure. This is a higher bar than failure of one psychological category or one Friction Signature model. The proposed mapped unit remains the complete bounded organism-relative biological event. A Level-6 challenge therefore requires persistent failure after state definition, endpoint homology, agent or context separation, measurement validity, predictor–criterion separation, and construct invariance have been adequately addressed.

The hierarchy prevents both overreaction and evasion. A single failed biomarker should not be described as total falsification, while repeated failure of a locked core or complete anchor cannot be dismissed indefinitely as a minor measurement problem.

Conditions That Would Weaken the Anesthesia Anchor

The anesthesia anchor is weakened if a prespecified suppressive state cannot be distinguished from its wakeful reference using the locked biological core; if the model fails to track induction, suppression, emergence, or recovery; if success depends upon equating behavioural unresponsiveness with absence of phenomenology; if ketamine-like or disconnected-consciousness boundaries cannot be represented within the **prespecified scope** without changing central definitions; if the multidimensional model provides no reproducible advantage over its strongest simpler comparator; or if results depend upon post hoc variables, signs, transforms, weights, thresholds, or endpoint substitutions.

The anchor is further weakened if independent datasets fail to reproduce the predicted organization, if expanded metabolic or autonomic/regulatory terms add no incremental performance, or if the biological trajectory fails to reorganize during independently characterized recovery.

Repeated failure of the locked anesthesia core:

$$[N^{(ana)}(t), C^{(ana)}(t), T^{(ana)}(t)]$$

under adequate measurement would be more consequential than failure of one secondary component, while still remaining distinct from automatic failure of the general Mapping strategy.

Conditions That Would Weaken the Rumination Anchor

The rumination anchor is weakened if the frozen biological model cannot distinguish sustained rumination from focused practical attention, negative affect without perseveration, or ordinary mind-wandering; if network performance is explained entirely by generic internal attention; if autonomic/regulatory findings reduce to immediate arousal; if hemodynamic effects are indistinguishable from generic cognitive effort; or if dynamical constructs require repeated post hoc redefinition.

The anchor is also weakened if the predictor depends upon the same state-rumination, recurrence, duration, or self-report variables used to define the criterion; if state expression cannot be distinguished from trait susceptibility; if any retained model claiming multidimensional integration provides no reproducible advantage over its strongest valid criterion-independent questionnaire, network, or other simpler comparator; or if the biological trajectory fails to reorganize when independently characterized rumination disengages or resolves.

The current upper-anchor core must be interpreted according to the locked Section 18.4 architecture. Repeated failure of a prospectively declared $N + T_{bio}$ core under adequate measurement would substantially weaken that core. If a valid criterion-independent biological temporal component is not justified before confirmatory model declaration, the appropriate intended core may instead be prospectively network-only and must be judged as that model class rather than restoring contaminated R or psychological persistence to preserve multidimensionality. If T_{bio} was required by an already declared $N + T_{bio}$ model but is unavailable in a particular dataset, that dataset yields a reduced implementation under the missing-data rules above and requires separate calibration and validation.

Conditions That Would Weaken the Paired Architecture

The paired architecture is weakened if the anchors require unrelated biological domains; if shared variables acquire incompatible meanings across states; if failed predictions trigger separate ad hoc mechanisms; if both models collapse into generic arousal or global-activity measures; if transformations are repeatedly altered after evaluation; if one or both anchors fail the generalization claims made for them; if any claimed multidimensional integration provides no reproducible advantage over simpler condition-specific alternatives; or if semantically similar biological profiles are assigned incompatible interpretations solely to protect the theory.

The decisive paired failure is cross-anchor construct-invariance failure. Both anchors may remain independently predictive while the paired claim fails if the invariant-domain dictionary cannot survive them without semantic drift.

Conditions That Would Substantially Weaken the General Mapping Strategy

The Mapping Theorem is not falsified by every failure of a first-generation equation. The current Friction Signature models are incomplete third-person measurement representations rather than the complete bounded biological event.

The general Mapping strategy would nevertheless be substantially weakened if repeated prospective research, after adequate control of state definition, endpoint homology, agent and context, measurement validity, criterion contamination, and construct invariance, showed that independently characterized organism-relative states could not be associated with reproducible identity-relevant biological organization; that prospective biological models required unlimited analytic flexibility or circular state definitions; that strong dissociations could be accommodated only through unconstrained ad hoc rescue; or that biologically and phenomenally distinct states repeatedly remained indistinguishable in every measured dimension capable of representing the proposed difference.

A still stronger challenge would arise if genuinely distinct primary phenomenal states were independently established while the corresponding **complete bounded organism-relative biological events** were shown to be identical in all identity-relevant respects. That result would directly conflict with the conditional identity entailment developed in Section 17.

Broad failure across both anchors would therefore be serious evidence against the present operational programme, but it is not identical to Level-5 paired failure and does not by itself establish Level-6 failure until local measurement and construct explanations have been appropriately excluded.

What Would Count as Strong Operational Support

Strong support requires more than retrospective agreement with existing literature.

The anesthesia model would need to distinguish its prespecified wakeful and suppressive states, track emergence and recovery, accommodate agent-specific boundary states within its declared scope, and survive manipulation or agent holdouts, participant holdouts, and external evaluation.

The rumination model would need to distinguish sustained rumination from focused practical attention, non-ruminative negative affect, calm rest, structured distraction, and ordinary mind-wandering where prespecified; track induction, persistence, disengagement, and resolution; and survive task, participant, population, and external holdouts appropriate to its stated scope.

Any anchor model for which multidimensional integration is claimed must demonstrate either superiority over its strongest individual components and shortcut models or another prespecified reproducible advantage that justifies that integration. A prospectively declared unidimensional core is instead challenged against relevant shortcut or non-biological comparators and makes no multidimensional-integration claim at that stage. Expanded components must earn incremental value beyond the core. Transformations, weights, thresholds, time windows, and comparison rules must remain frozen during evaluation.

The paired architecture additionally requires cross-anchor construct invariance under one methodological standard. If the Stochastic Pump is retained as a distinct systems-level construct, its coordination model must also provide independent incremental value beyond the same biological components without coordination terms.

No single successful experiment establishes strict identity. Repeated prospective success progressively strengthens the operational measurement architecture and constrains the biological side of the proposed mapping.

Relationship to Strict Identity

Successful anchor validation would establish that a frozen **measurement model** predicts or tracks independently characterized states in the manner specified. The controlling measurement distinction remains:

$$FS \neq B_{event}$$

because the Friction Signature is an incomplete operational measurement representation rather than the complete mapped biological event and is therefore not itself the phenomenal identity target.

The ontological proposition remains:

$$B_{event} \leftrightarrow P_{primary}$$

where B_{event} denotes the complete bounded organism-relative biological event and $P_{primary}$ denotes independently characterized primary phenomenology.

Statistical discrimination, calibration, trajectory prediction, and even successful paired-anchor validation can constrain the biological side of that proposition. They cannot, by classification alone, establish strict phenomenology–biology identity.

Scientific Importance of Quantitative Validation

Successful quantitative validation would be scientifically important even though statistical classification cannot establish strict identity. It would show that the proposed measurement architecture is not unconstrained, that independently characterized organism-relative states are accompanied by reproducible biological trajectories, that biologically defined access- or recursive-related variables can exhibit predictable consequences where they are independently operationalized, and that state-specific predictions survive prospective testing.

A stronger result would further show that the same methodological architecture and any genuinely shared constructs survive both anchors without post hoc semantic revision. That claim is conditional on successful cross-anchor construct invariance; it is not established merely because anesthesia and rumination can each be modelled separately.

Such results would move the programme from conceptual and directional correspondence toward progressively constrained quantitative correspondence on the biological side of the proposed mapping. They would not, by themselves, establish that the complete bounded biological event and primary phenomenology are strictly identical.

Present Testing Standard

At the present stage, the candidate anchor models should be judged according to whether they are:

operationally coherent;

biologically grounded at the level claimed;

empirically motivated;

prospectively testable;

externally evaluable;

calibrated where calibration is claimed;

transportable only within demonstrated scope;

and vulnerable to clearly specified failure.

They should not be judged as mature universal laws. Final component constructions, transformations, weights, thresholds, calibration behaviour, individual-level performance, cross-method construct continuity, external transportability, Pump coordination advantage, and paired-anchor invariance remain unresolved.

The immediate scientific objective is therefore not to maximize apparent certainty. It is to discriminate genuine predictive structure from retrospective fit while preserving clear failure conditions. [211, 238–241]

Summary

The quantitative anchor programme must proceed through the staged sequence:

$$\begin{gathered}\text{development/calibration}\\ \rightarrow\\ \text{manipulation, agent, or task holdout}\\ \rightarrow\\ \text{participant holdout}\\ \rightarrow\\ \text{external replication or transportability}\end{gathered}$$

All primary state definitions, predictor variables, component constructions, transformations, weights, thresholds, temporal windows, comparison conditions, missing-data rules, performance metrics, and success or failure criteria must be frozen before the relevant confirmatory test.

The anesthesia anchor must distinguish a prespecified suppressive state from its wakeful reference, track induction and recovery, preserve agent-specific boundaries, separate behavioural unresponsiveness from phenomenal absence, and demonstrate that any retained multidimensional architecture provides reproducible value beyond its strongest simpler comparators.

The rumination anchor must distinguish independently characterized sustained rumination from prespecified strong comparison conditions, especially focused practical attention, and where included negative affect without perseveration, rest, mind-wandering, and other controls; track persistence and disengagement; distinguish state expression from trait susceptibility; and show that its biological predictor contributes information beyond the psychological variables used to define the state.

For both anchors, the declared core is the initial benchmark; it is multidimensional only when its prospectively declared component membership contains more than one biological component. Expanded components remain in the predictive model only if they provide prespecified incremental empirical performance beyond the core on untouched data. Biological interpretability may remain scientifically useful but cannot rescue a quantitatively inferior expanded model.

The paired architecture requires more than separate success of both anchors. Shared constructs must retain invariant meanings across the two programmes under one methodological standard. Both anchors may therefore succeed independently while the paired architecture fails at Level 5 if cross-anchor construct invariance fails.

The Stochastic Pump carries an additional burden. Its coordination model must provide reproducible incremental value beyond the same biological components considered without Pump-specific coordination terms, and the coordination principle must retain the same theoretical meaning across anesthesia suppression/emergence and rumination persistence/disengagement.

The strongest failure conditions therefore include repeated failure of a locked anchor core under adequate measurement, repeated failure of one or both prospectively declared full anchor models within their stated scope, failure of the Pump coordination model to add independent value, and failure of the paired architecture to preserve shared-domain meanings even when the individual anchors perform adequately. Broader failure of both anchors would seriously weaken the present Friction Signature operational

programme but is not identical to paired-architecture failure and does not automatically establish failure of the general Mapping strategy.

These requirements ensure that the quantitative programme is not merely compatible with existing evidence. It is structured so that future evidence can support, constrain, localize failure, require a new model generation, or substantially weaken the operational architecture.

The following subsection states the scientific contribution and present status of the quantitative extension as a whole.

18.8 Interpretation, Scientific Contribution, and Present Status

Section 18 has translated the conceptual architecture established in Section 17 into a first-generation quantitative research programme. Its purpose has not been to convert phenomenology into a numerical score or to claim that a classifier is an identity equation. It has been to specify how selected biological observations can be constructed into state-specific measurement models, constrained by two markedly different perturbational anchors, and exposed to prospective comparison, generalization, and failure.

The two anchors are complementary rather than scalar opposites. The anesthesia anchor tests reversible suppressive disruption and reorganization across wakefulness, induction, suppression, emergence, and recovery. The rumination anchor tests sustained perseverative or self-referential cognition, including persistence, disengagement, and resolution. Neither anchor represents a quantity of consciousness. Their scientific value lies in whether independently characterized states can be tracked by prespecified biological models while the meanings of any claimed shared constructs remain stable.

The primary paired object is therefore the pair of anchor-specific trajectories:

$$\mathcal{T}_{anchors} = \langle \tau_{ana}, \tau_{rum} \rangle$$

This notation does not imply common time, common units, numerical symmetry, or a validated shared metric state-space. The trajectories may arise from different participants, experiments, instruments, and temporal scales, and their prospectively declared component memberships and dimensionalities may differ. The ordered pair $\mathcal{T}_{anchors}$ is therefore a bookkeeping representation, not a concatenated vector or common metric object; direct numerical distance between the complete anchor trajectories is undefined unless a separate shared-domain projection and comparison rule are prospectively specified and validated.

Where scalar summaries are retained within the individual anchor models, they may be represented abstractly as:

$$\mathcal{S}_{anchors} = \langle S_{ana}, S_{rum} \rangle$$

The two scores remain state-specific summaries. They must not be summed or interpreted as coordinates on a universal consciousness scale:

$$S_{ana} + S_{rum} \neq \text{total consciousness}$$

A higher anesthesia score indicates greater expression of the prespecified anesthesia profile for the tested agent and regime. A higher rumination score indicates greater expression of the prespecified rumination-related biological profile. Neither score measures more or less phenomenology in a direct numerical sense.

Interpretation of the Friction Signature Architecture

The Friction Signature framework in Section 18 is a measurement architecture, not a declaration that six biological natural kinds have already been discovered. The proposed domain dictionary contains the candidate dimensions:

$$R,\ A,\ M,\ N,\ C,\ T$$

but the empirical status of those dimensions differs across anchors, and not every dimension currently qualifies as an independent biological predictor in every model.

The controlling rule remains:

$$\begin{gathered}\text{same label}\\ \neq\\ \text{same construct}\end{gathered}$$

A cross-anchor domain is scientifically meaningful only if its theoretical meaning can be frozen while allowing prespecified state-specific manifestations and method-specific measurements. Direct evidence for cross-anchor invariance can be supplied only by domains prospectively retained in both relevant anchor-specific models under that frozen meaning; a domain retained in only one anchor, or unmeasured in the other, does not cast a positive paired-invariance vote.

Network organization, N, is presently the strongest candidate for future cross-anchor continuity among the biological domains retained across both anchors, but that continuity has not yet been validated; functional connectivity, effective connectivity, topology, integration, modularity, and dynamic connectivity remain distinct measurement families. [38, 39, 212–215, 228, 229, 232–234]

The autonomic/regulatory domain, A, refers to acute autonomic or regulatory organization unless a validated cumulative multisystem allostatic-load measure is explicitly included. Autonomic regulation and allostatic load must not be treated as interchangeable constructs. [12, 13, 120, 222–224]

The metabolic/energetic domain, M, is directly tractable in anesthesia through appropriate metabolic measurements, whereas direct state-rumination metabolic quantification remains [NDR] within the audited literature. BOLD or other hemodynamic signals may enter a hemodynamic model but do not become direct measurements of glucose utilization, oxygen consumption, ATP turnover, heat production, or total energetic cost by relabeling them as metabolism. Direct paired metabolic-invariance testing therefore remains a future empirical requirement. [42, 112, 118, 218–221]

The dynamical domain, C, refers to neural or signal dynamical organization where a valid construct can be specified. Perturbational complexity, Lempel-Ziv complexity, permutation entropy, dynamic connectivity, stability, recurrence, dwell, and flexibility are not interchangeable. Neural or signal complexity must also remain distinct from thermodynamic entropy production. [39, 215, 232–235]

The temporal domain, T, refers to a prespecified biological temporal property within the measured state, such as dwell, recurrence, transition, recovery, disengagement, or lag. It is not identical to the state-specific trajectory as a whole.

The recursive/access domain, R, remains especially constrained. Behavioural responsiveness, report, recall, thought sampling, psychological persistence, self-reference, or state-rumination ratings cannot function as independent biological predictors when they also define or evaluate the target state. Unless a criterion-independent biological estimator is established, recursive/access variables remain outside the confirmatory biological predictor and can instead serve as state-characterization or downstream variables.

The Friction Signature domain is therefore provisional and operational. Its value must be earned empirically through construct validity, reliability, prospective prediction, and performance beyond simpler models.

Relationship to the Mapping Theorem

Section 18 inherits the ontology established in Section 17 rather than redefining it.

At the ontological level, the Mapping Theorem proposes:

$$\begin{gathered}B_{event}\\ \leftrightarrow\\ P_{primary}\end{gathered}$$

where B_{event} denotes the complete bounded organism-relative biological event and $P_{primary}$ denotes independently characterized primary phenomenology. Within the framework, these are proposed as two characterizations of one occurrence. This remains the identity-level proposition to be progressively constrained; it is not a fitted equation and has not been prospectively demonstrated.

The quantitative programme addresses a different relation:

$$X^{(s)} \rightarrow \phi^{(s)} \rightarrow M^{(s)}$$

where $X^{(s)}$ denotes selected biological observations, $\phi^{(s)}$ their prespecified construction and state-specific transformation, and $M^{(s)}$ the resulting candidate measurement model.

Accordingly:

$$FS \neq B_{event}$$

The Friction Signature representation is incomplete third-person measurement access to the biological side of the proposed mapping. It is not the complete biological event, is not primary phenomenology, and is not the object of the strict identity claim.

Successful biological classification, trajectory prediction, calibration, or paired-anchor validation can therefore strengthen the measurement architecture and progressively constrain the biological organizations compatible with the Mapping proposition. None of those achievements, by itself, establishes:

$$B_{event} \equiv P_{primary}$$

as an empirically proven identity law. Here $=$ denotes the stronger strict-identity reading of the Mapping proposition rather than a fitted measurement relation.

The same restriction applies to the framework's account of the recursive narrator. Successful prediction of biological variables associated with access, self-reference, report, memory, or perseverative cognition would support the proposed architecture in which narrator-level organization is downstream and materially implemented. It would not directly observe an independently established entity called the narrator, nor would it convert the structural-closure argument into an empirical result of classification.

Scientific Contribution of the Quantitative Extension

The quantitative extension contributes scientific constraint in several ways.

First, it separates the ontological mapping proposition from the measurement representation used to test it. This prevents a successful Friction Signature model from being mistaken for the complete biological event or for phenomenology itself.

Second, it defines two distinct perturbational anchors without placing them on a single scalar axis. Reversible anesthesia suppression and sustained rumination challenge the architecture under different forms of biological and cognitive organization.

Third, it requires state-specific measurement construction rather than direct addition of heterogeneous observables. Candidate measurements are constructed and transformed according to prespecified rules before they enter a model.

Fourth, it treats additive and non-negative scalar models as provisional model classes rather than as theorem-level necessities. Trajectory-based representations remain primary where scalar compression would obscure asynchronous, non-monotonic, or agent-specific structure.

Fifth, any anchor model for which multidimensional integration is claimed must compete with its strongest simpler alternatives. A multidimensional core or expanded Friction Signature model does not earn scientific privilege merely because it contains more biological variables; a prospectively declared unidimensional core instead faces the relevant shortcut or non-biological comparators without making a multidimensional-integration claim at that stage.

Sixth, it separates state criteria from biological predictors and downstream access or report variables. This creates a genuine prediction problem rather than allowing the model to validate itself against a criterion partly constructed from the same biology.

Seventh, it requires staged independent evaluation:

$$\begin{gathered}\text{development/calibration}\\ \rightarrow\\ \text{manipulation, agent, or task holdout}\\ \rightarrow\\ \text{participant holdout}\\ \rightarrow\\ \text{external replication or transportability}\end{gathered}$$

These stages test different forms of generalization and cannot be collapsed into one generic claim of validation. [239–241]

Eighth, it requires cross-method construct validity rather than numerical equivalence. Functional connectivity is not effective connectivity; PCI is not Lempel-Ziv complexity or permutation entropy; HRV is not cortisol; and BOLD is not direct glucose metabolism. Different methods may converge only through a separately justified construct.

Ninth, it establishes an explicit anti-rescue rule:

$$\begin{gathered}\text{locked model}\\ \rightarrow\\ \text{independent test}\\ \rightarrow\\ \text{result}\\ \rightarrow\\ \text{new model if revised}\\ \rightarrow\\ \text{new independent validation}\end{gathered}$$

A failed locked model remains failed. Post hoc improvement creates a new model generation rather than retroactively validating the original one. [211, 238, 241]

Tenth, it defines hierarchical failure. Failure of one observed measure, one expanded component, an anchor core, a prospectively declared full anchor model, the paired architecture, and the general Mapping strategy do not carry the same theoretical consequence. In particular, both anchors may succeed independently while the paired architecture fails if shared-domain meanings cannot remain invariant.

Eleventh, it subjects the Stochastic Pump to an independent-value test. The Pump is retained only as the framework's proposed systems-level support architecture organizing distributed biological work. Component-level biological success does not establish a Pump-level contribution. A Pump coordination model must provide reproducible incremental value beyond the same components considered without the proposed coordination structure, and its systems-level meaning must remain invariant across the two anchors.

Together, these requirements transform the Mapping proposal from an unconstrained biological correspondence claim into a programme in which explanatory freedom can be progressively reduced by prospective evidence.

Current Empirical Alignment

The existing empirical literature provides substantial component-level support relevant to the anesthesia anchor. Network reorganization, perturbational or signal-complexity changes, structured induction and emergence trajectories, direct metabolic effects, and acute autonomic or regulatory changes are all empirically tractable, although their exact profiles remain agent-, endpoint-, and method-dependent. [38–40, 50, 75, 212–224, 236, 237]

The rumination literature provides convergent but more heterogeneous support. Rumination and related perseverative cognition are established psychological targets with evidence for temporal persistence, network involvement, physiological concomitants, and selected state-related dynamical effects. The clean biological predictor architecture is less mature. Network organization is presently the strongest biological component; criterion-independent biological temporal measures remain conditional; direct state-rumination metabolic quantification remains [NDR] within the audited literature; and a stable cross-paradigm dynamical construct has not yet been established. [12, 13, 21, 227–235]

The existing literature therefore provides sufficient component-level grounding to motivate prospective model testing. It does not constitute completed validation of either prospectively declared full anchor model or of the paired architecture.

The evidential ladder remains:

$$\begin{gathered}\text{component-level empirical support} \\ \neq \\ \text{candidate anchor model} \\ \neq \\ \text{validated anchor model} \\ \neq \\ \text{validated paired architecture}\end{gathered}$$

Cross-anchor construct invariance has not yet been demonstrated. A common metric biological state-space has not yet been validated. Final transformations, weights, thresholds, decision functions, and model-generation component sets remain development-stage empirical matters that must be frozen before confirmatory evaluation. The Pump coordination advantage has not yet been established. Necessity, sufficiency, and strict identity remain beyond the present evidence.

What Has Been Achieved

Section 18 has specified a coherent first-generation quantitative operationalization of the Mapping programme.

It has defined the relation between observed biology, constructed measurement components, and candidate state-specific models. It has specified two complementary perturbational anchors. It has prioritized trajectory-based representations while permitting carefully qualified scalar summaries. It has defined core and expanded model competition, strongest-simple-model challenges, comparison conditions, reversibility tests, the distinction between prospectively declared model classes and reduced implementations, missing-data rules, cross-method requirements, cross-anchor invariance, staged holdouts, and explicit failure conditions.

It has also separated the Friction Signature measurement representation from the complete biological event and from primary phenomenology, preserved the distinction between behavioural or report endpoints and the biological predictor, and made the Stochastic Pump vulnerable to a direct incremental-value test.

These are formal and methodological achievements. They should not be redescribed as completed empirical validation.

What Has Not Been Achieved

The present programme has not established final numerical weights, transformations, thresholds, or universal component definitions.

It has not prospectively validated the prospectively declared full anesthesia anchor model on the required holdout sequence.

It has not prospectively validated the rumination core alternatives defined in Section 18.4: an $N + T_{bio}$ core when a criterion-independent biological temporal component is justified, or a prospectively declared network-only core when it is not.

It has not demonstrated that expanded models outperform their cores or that any model claiming multidimensional integration reproducibly outperforms or otherwise earns a prespecified advantage over its strongest simpler competitors.

It has not demonstrated individual-level tracking across the intended scope, external transportability, cross-laboratory replication, or cross-method measurement invariance.

It has not established cross-anchor construct invariance or a common metric state-space.

It has not demonstrated that the Stochastic Pump coordination architecture adds reproducible value beyond its biological components.

It has not established necessity or sufficiency for any prospectively declared full Friction Signature measurement model.

It has not directly demonstrated strict identity between the complete bounded biological event and primary phenomenology.

These are not hidden qualifications. They define the next empirical programme.

Present Testing Standard and Path Forward

The immediate task is empirical rather than further expansion of the first-generation architecture. Candidate models should now be judged by whether they can be frozen, tested on independent perturbational or task holdouts, generalized to new participants, transported across relevant populations and methods, and compared against stronger simpler alternatives without semantic or analytic rescue. [211, 238–241]

For anesthesia, this requires temporally aligned study across independently defined wakefulness, induction, suppressive states, emergence, and recovery, together with agent-specific boundary testing. Behavioural unresponsiveness cannot substitute for phenomenal-state definition.

For rumination, the biological model must be tested against strong comparison states, especially focused practical attention, while separating current state expression from trait susceptibility and preventing psychological state-definition variables from re-entering as nominally independent biological predictors.

For the paired architecture, the invariant-domain dictionary must be frozen before confirmatory cross-anchor testing. Direct invariance claims are restricted to domains prospectively retained in both relevant anchor models. Success in both anchors is insufficient if the shared constructs change meaning between them.

For the Stochastic Pump, the decisive test remains whether the proposed coordination architecture adds reproducible information or constraint beyond a component-only model.

The programme should advance only through prospective cycles in which failures remain visible. Any revision after a failed locked test constitutes a new model and must encounter new independent data.

Subsequent content-specific mapping applications can then be evaluated against this frozen general architecture rather than used to redefine it retrospectively. Their value will lie in testing whether the same ontology, measurement distinctions, predictor–criterion separation, and anti-rescue rules survive a more fine-grained mapping problem.

Implications for the Explanatory Programme

Section 18 does not close the explanatory gap by declaring a correlation to be identity. Its contribution is methodological: it gives the biological side of the Mapping proposition enough structure that the proposed relation can be progressively constrained rather than protected by conceptual flexibility.

Section 17 specifies the theoretical target: primary phenomenology is proposed as the organism-relative inside aspect of the complete bounded biological event, while narrator-level recognition, ownership, autobiographical interpretation, and report are downstream recursive organizations.

Section 18 specifies how selected measurements of the biological side can be transformed into prospective models and exposed to perturbation, comparison, generalization, dissociation, model competition, and failure.

Successful tests would progressively reduce the class of biological organizations compatible with the Mapping proposition. Failed tests would localize weakness in a measurement, component, anchor, paired architecture, or, under sufficiently broad and well-controlled failure, the general Mapping strategy.

That is a stronger scientific position than either an unconstrained identity assertion or a catalogue of neural correlates. It places the proposed bridge under explicit empirical constraint while leaving strict identity as a proposition to be earned rather than assumed.

Present Scientific Conclusion

The quantitative extension should therefore be described as a **falsifiable biological mapping architecture with initial dual-anchor quantitative operationalization and a defined path toward prospective validation**.

That status should neither be understated nor overstated.

The framework has specified an event-level Mapping proposition, an incomplete but explicit biological measurement interface, two complementary perturbational anchors, state-specific model construction, trajectory-based models, simpler-model competition, cross-anchor invariance requirements, a direct test of the Stochastic Pump's independent value, staged independent validation, and hierarchical failure conditions.

Current evidence provides component-level biological grounding and empirical alignment sufficient to motivate prospective testing. It does not yet validate either prospectively declared full anchor model, the paired architecture, a common metric state-space, the Pump coordination advantage, or strict phenomenology–biology identity.

The strongest justified present conclusion is therefore that the Mapping Theorem has generated a constrained and scientifically vulnerable first-generation quantitative programme capable of testing whether independently characterized organism-relative states correspond prospectively to reproducible biological organizations while preserving a stable ontology and explicit failure conditions.

Whether that programme survives prospective validation—and whether progressively stronger evidence ultimately warrants a substantially stronger identity claim—must be determined by future empirical work.

Notation and Abbreviations

The table below contains the abbreviations and formal notation used in the manuscript. Framework terms such as *Grind*, *Glow*, *Stochastic Pump*, and *Friction Signature* are defined in the Glossary; only abbreviations or mathematical symbols needed to read the formal expressions are included here.

Abbreviations and Framework Labels

Abbreviation / label	Meaning
ATP	Adenosine triphosphate
BOLD	Blood-oxygen-level-dependent signal
$CMRO_2$	Cerebral metabolic rate of oxygen
EEG	Electroencephalography
FS	Friction Signature
HRV	Heart-rate variability
L1	Primary Integration Layer / Resolution Engine
L2	Secondary Audit Loop / Recursive Audit Layer
NDR	New data required
PCI	Perturbational Complexity Index
PET	Positron emission tomography
REM	Rapid eye movement
TMS-EEG	Transcranial magnetic stimulation–electroencephalography
ana	Anesthesia anchor/state index
rum	Rumination anchor/state index

General Temporal and Recursive Notation

Symbol	Meaning / use
t_{L1}	Reference time at which sufficient L1 integration/resolution has occurred for the event under analysis.
t_{L2}	Earliest recursive availability for L2 recognition, comparison, attribution, or report.
t_s	System Latency, with $t_s = t_{L2} - t_{L1}$ and $t_s > 0$.
$M_\emptyset$	Event-relative Magnitude Threshold; no universal numerical value is assumed.
$n,\ n+1$	Successive event or recursive-cycle indices; they do not imply universal discrete time steps.
$L1_n$	L1 state/event indexed as event n.
$L2_n$	L2 interpretation/audit associated with event n.
I_n	Internally generated stimulus arising from recursive interpretation of event n.
$P(\text{next unnecessary thought} \mid \text{current unnecessary}$	Conditional probability that a current unnecessary/non-demand-responsive thought recruits another unnecessary thought.

Mapping Notation

Symbol	Meaning / use
B_{event}	Complete bounded organism-relative biological event proposed as the biological side of the Mapping relation.
$P_{primary}$	Independently characterized primary phenomenology proposed as the phenomenal side of the Mapping relation.
$B_{event} \leftrightarrow P_{primary}$	Proposed event-level Mapping relation: the biological event and primary phenomenology are treated as two characterizations/aspects of one organized occurrence. This is the framework's theoretical proposition, not a fitted measurement equation.
$B_{event} \equiv P_{primary}$	Stronger strict-identity reading. The manuscript treats this as an empirical target that has not yet been prospectively demonstrated.

Generic Friction-Signature and Measurement-Model Notation

Symbol	Meaning / use
$s \in \{ana, rum\}$	Anchor index, where ana denotes anesthesia and rum denotes rumination.
$FS(t) = [R(t), A(t), M(t), N(t), C(t), T(t)]$	First-generation shared Friction Signature operational measurement vector. It is an incomplete measurement representation, not the complete biological event and not phenomenology itself.
R	Recursive/access-related candidate domain.
A	Autonomic/regulatory candidate domain.
M	Metabolic/energetic candidate domain.
N	Network-organization candidate domain.
C	Neural/signal dynamical-organization or complexity candidate domain.
T	Criterion-independent biological within-window temporal candidate domain.
$\mathcal{D} = \{R, A, M, N, C, T\}$	Set of candidate Friction Signature domain labels.
$FS^{(s)}(t)$	State-specific instantiation of the shared six-domain Friction Signature template.
$X^{(s)}$	Selected biological observations under state/anchor s.
$X_{ij}^{(s)}(t)$	Observed biological measure j associated with candidate dimension i under anchor s.
i	Candidate Friction Signature domain/component index.
j	Observed-measure index within candidate dimension i.
k_i	Number of eligible observed measures contributing to the constructed estimate of candidate dimension i in the generic construction expression.
$X_i^{(s)}(t)$	Constructed state-specific estimate of candidate dimension i.
$f_i^{(s)}$	Prespecified procedure that constructs $X_i^{(s)}(t)$ from eligible observed measures.
$B_i^{(s)}$	Baseline/calibration information for candidate dimension i under anchor s.
$\phi^{(s)}$	Prespecified state-specific construction/transformation procedure in the generic measurement pipeline.
$\phi_i^{(s)}(t)$	Transformed operational score for candidate dimension i under anchor s.

$g_i^{(s)}$	State-specific transformation function mapping biology and baseline information into $\phi_i^{(s)}(t)$.
$Z_i^{(s)}(t)$	Example baseline-standardized value for component i.
$\mu_i^{(s)},\ \sigma_i^{(s)}$	Development/calibration reference mean and standard deviation used in illustrative standardization.
$u_i^{(s)}$	Prespecified directional sign, with $u_i^{(s)} \in \{-1, +1\}$ in the illustrative monotonic transform.
$h_i^{(s)}$	Optional bounded calibration mapping.
$a_i^{(s)},\ b_i^{(s)}$	Logistic calibration parameters in the illustrative bounded transform.
z	Scalar input variable to the illustrative logistic calibration function $h_i^{(s)}(z)$.
$d_i^{(s)}$	Component/profile-level anchor- and method-specific configuration transform used for prespecified target resemblance/departure; distinct from the anchor-level state-separation statistic d_s.
$M^{(s)}$	Candidate state-specific measurement model evaluated against an independently defined target-state criterion. Here and in subscripted model forms, M denotes a model object; this is distinct from $M(t)$, the metabolic/energetic Friction Signature domain.
$M_{core}^{(s)}$	Prospectively declared anchor-core model used in model-performance comparisons.
$M_{expanded}^{(s)}$	Prospectively declared expanded anchor model containing the core plus one or more added candidate dimensions.
$M_{simple,best}^{(s)}$	Strongest prespecified simpler comparator used when evaluating whether the declared core has earned incremental value.
$S_s(t)$	Optional candidate scalar summary for anchor s; not a universal consciousness quantity.
$S_{s,core}(t)$	Candidate scalar core model for anchor s when a scalar core is prospectively declared.
$S_{ana}(t),\ S_{rum}(t)$	State-specific scalar summaries for anesthesia and rumination respectively; they are not directly commensurate.
k_s	Number of prospectively retained components in scalar model S_s, with $k_s \geq 1$.
$w_i^{(s)}$	Candidate component weight in scalar model S_s.
$w_i^{(s,0)} = 1/k_s$	Illustrative equal-weight reference.
$S_{s,expanded}(t)$	Candidate expanded scalar model containing the declared core plus prospectively retained added components.
$\lambda_{core}^{(s)},\ \lambda_j^{(s)}$	Provisional expanded-model weights for the core and added component j.
m_s	Number of added candidate dimensions beyond the core; for an actually instantiated expanded model, $m_s \geq 1$.
$\Phi^{(s)}(t)$	Ordered vector of transformed components retained in the declared state-specific trajectory model.
$\Phi_{\text{full}}^{(s)}(t)$	Full six-domain state-specific reference template; an anchor-specific model need not retain all six domains.
τ_s	State-specific trajectory formed from the ordered sequence of declared component vectors over time.

d_s	Anchor-level state-separation decision/statistic function selected or calibrated in development; distinct from the component/profile transform $d_i^{(s)}$.
δ_s	State-separation threshold frozen before independent evaluation.

Anesthesia-Anchor Notation

Symbol	Meaning / use
$FS^{(ana)}(t)$	Full six-domain anesthesia instantiation of the shared Friction Signature template.
$FS_{ana,core}(t) = [N^{(ana)}(t), C^{(ana)}(t), T^{(ana)}(t)]$	Current candidate anesthesia biological core.
$N^{(ana)}(t)$	Anesthesia network-organization component.
$C^{(ana)}(t)$	Anesthesia neural/signal-complexity or dynamical-organization component; distinct from thermodynamic entropy.
$T^{(ana)}(t)$	Anesthesia biological within-window temporal component; excludes behavioural-report and later cognitive-recovery variables.
$M^{(ana)}(t)$	Candidate anesthesia metabolic/energetic component.
$A^{(ana)}(t)$	Candidate anesthesia acute autonomic/regulatory component.
$S_{ana,core}(t)$	Candidate additive anesthesia core scalar.
$S^{(0)}_{ana,core}(t)$	Equal-weight anesthesia core reference.
$S_{ana,expanded}(t)$	Candidate expanded anesthesia scalar incorporating prospectively retained additional domains.
$\Phi^{(ana)}_{bio}(t)$	Declared biological component vector for the anesthesia trajectory.
$\Phi^{(ana)}_{bio,full}(t)$	Five-domain candidate anesthesia biological trajectory template $[\phi_N, \phi_C, \phi_T, \phi_M, \phi_A]$; it contains transformed operational components, not raw domain labels.
τ_{ana}	Anesthesia state-specific trajectory.
$d_{ana},\ \delta_{ana}$	Anesthesia state-separation function/statistic and its frozen threshold.

Rumination-Anchor Notation

Symbol	Meaning / use
$FS^{(rum)}(t)$	Full six-domain rumination instantiation of the shared Friction Signature template.
$FS_{rum,core}(t)$	Candidate rumination biological core; $[N^{(rum)}(t), T^{(rum)}_{bio}(t)]$ only when a criterion-independent temporal component is justified. A prospectively declared network-only core remains permitted.
$N^{(rum)}(t)$	Rumination network-organization component.
$T^{(rum)}_{bio}(t)$	Criterion-independent biological temporal component for rumination.
$A^{(rum)}(t)$	Candidate acute autonomic/regulatory rumination component.
$C^{(rum)}(t)$	Candidate rumination dynamical-organization component.
$M^{(rum)}_{direct},\ M^{(rum)}_{direct}$	Equivalent forms used in the manuscript for the direct state-rumination metabolic/energetic component. Its current empirical status is $[\mathrm{NDR}]$, where NDR is a textual research-status marker rather than a numerical quantity.

$S_{rum,core}(t)$	Candidate additive rumination core scalar when both N and T_{bio} are prospectively retained.
$S^{(0)}_{rum,core}(t)$	Equal-weight rumination core reference.
$S_{rum,expanded}(t)$	Candidate expanded rumination scalar containing prospectively retained additional components.
$\Phi^{(rum)}_{bio}(t)$	Ordered biological component vector retained in the declared rumination trajectory.
$\Phi^{(rum)}_{bio,full}(t)$	Current four-domain full biological candidate rumination trajectory template $[\phi_N, \phi_T, \phi_A, \phi_C]$; it contains transformed operational components, not raw domain labels.
τ_{rum}	Rumination state-specific trajectory.
$d_{rum},\ \delta_{rum}$	Rumination state-separation function/statistic and its frozen threshold.

Paired-Anchor, Reduced-Model, and Pump-Comparison Notation

Symbol	Meaning / use
$\mathcal{S}_{anchors} = \langle S_{ana}, S_{rum} \rangle$	Ordered bookkeeping pair of optional state-specific scalar summaries; not a common consciousness scale.
$\mathcal{T}_{anchors} = \langle \tau_{ana}, \tau_{rum} \rangle$	Ordered bookkeeping pair of independently sampled anchor trajectories; not a concatenated vector or common metric state-space.
$\mathcal{P}(M)$	Prospectively oriented model-performance/utility function, defined so larger values indicate better primary-criterion performance after any prespecified orientation transform.
$\Delta\mathcal{P}_{s,core}$	Incremental performance of the declared anchor core relative to the strongest prespecified simpler comparator.
$\Delta\mathcal{P}_{s,expanded}$	Incremental performance of an expanded model relative to its declared core.
$S^{available}_{s}(t)$	Available-component renormalized scalar used only for an explicitly identified reduced implementation when required measurements are unavailable; it requires separate calibration/validation and is not equivalent to the declared full model.
Ω_s	Set of required components actually available in a reduced implementation.
$M^{(s)}_{components}$	Component-only comparison model using the retained constituent biological information without explicit Pump-coordination terms.
F_s	Function defining the component-only model.
$M^{(s)}_{pump}$	Pump-coordination model using the same eligible constituent information plus prespecified organizational relations.
G_s	Function defining the Pump-coordination model.
$\mathcal{R}^{(s)}$	Prespecified cross-component relations used by the Pump-coordination model.
$\mathcal{O}^{(s)}$	Prespecified temporal/phase-ordering relations used by the Pump-coordination model.
$\mathcal{Q}^{(s)}$	Prespecified recovery, disengagement, or restored-availability structure used by the Pump-coordination model.
$\Delta\mathcal{P}_{pump,s}$	Incremental performance of the Pump-coordination model relative to the component-only model after accounting for added complexity.

Relations and Conventions

Relation / convention	Interpretation
$FS \neq B_{event}$	The Friction Signature is an incomplete operational measurement representation, not the complete bounded biological event.
$FS \neq P_{primary}$	The Friction Signature is not primary phenomenology.
$S_{ana} + S_{run} \neq$ total consciousness	The two anchor-specific scores are not additive coordinates of a universal consciousness quantity.
same domain label $\neq$ same latent construct	Shared notation across anchors does not establish construct invariance; cross-anchor invariance must be validated.
anesthesia anchor success $\wedge$ rumination anchor succes	Separate success of both anchors does not by itself establish the paired architecture; shared-domain construct invariance is additionally required.

Glossary

Term	Definition
active recursive audit	Present recruitment of retained representations into organism-relative comparison, projection and evaluation; not an act initiated by an antecedent self.
actual-demand operational boundary	Independently constrained distinction between cognition coupled to an unresolved practical/organismic/learning/creative/environmental requirement and continuation sustained primarily by recursive relevance of internally generated content.
agent holdout	Independent anesthetic-agent challenge required only when cross-agent generalization is prospectively claimed.
allostatic burden / load	Cumulative multi-system biological dysregulation/cost associated with repeated or prolonged regulatory recruitment; distinct from acute autonomic activation in one event.
anatomical essentialism	Treating a familiar anatomical substrate as necessary merely because known implementations occur there, without specifying the indispensable organization it contributes.
anesthesia biological core	Current candidate lower-anchor core N/C/T: network organization, neural/signal complexity, and a purified biological within-window temporal component; operational proposal, not an established natural decomposition.
anesthesia suppression anchor	Agent- and regime-specific perturbational programme testing a structured, reversible biological departure from wakeful reference organization while responsiveness, report, memory, connectedness and experiential evidence remain analytically separate.
anti-immunization constraint	Methodological requirement that scope, residual pathways, incomplete perception, stabilization and unspecified biology cannot function as unrestricted devices for protecting the framework from disconfirming evidence.
anti-rescue rule	Once a confirmatory model is locked, post-hoc changes to dimensions, transformations, weights, thresholds or construct meanings constitute a documented new model generation requiring new independent validation rather than retroactively converting failure into success.
apparent authorship	Experienced ownership/causal authorship attributed to the recurring narrator-level reference after a thought or action has been generated sufficiently for recognition and attribution.
apparent irreducible remainder	Apparent explanatory residue produced when phenomenology is represented as something delivered to an independently existing recipient; within the framework the residue is reduced by relocating the apparent owner to the downstream recursive architecture that generates it.
apparent priority	First-person appearance that the narrator/owner was already present before the processes it later recognizes or claims. Section 14.4 distinguishes this representational priority from temporal and causal priority.
apparent thinker	Reified form of the recurring self-reference when it is represented as a thinker standing prior to and producing thought.

authorship reversal	Framework term for the representational inversion in which organismic and cognitive processes generate the recurring representation of "me," while that representation presents the apparent "me" as though it were the antecedent owner or author of those processes; this does not deny organismic agency or the causal efficacy of cognition.
autobiographical continuation	Recruitment of self-indexed memory, interpretation and projection that extends cognition around the virtual reference point beyond the initiating event.
autobiographical defence	Recruitment of wider self-indexed personal history to defend, explain, validate or stabilize the virtual reference point in response to a present challenge.
automatic recursive relevance	Candidate mechanism by which internally generated representational content acquires sufficient conditioned evaluative weighting to recruit another cognitive operation without requiring a new external event or a conscious inner evaluator.
autonomic trajectory	Time-structured organismic response including onset, amplification, duration, reactivation and recovery rather than a single peak autonomic measure.
background implementation	Slower or ongoing maintenance, clearance, repair and renewal that preserves participating tissues' capacity for future event-specific recruitment.
background readiness	Maintained pre-event condition supporting possible future state-transitions; continuous support capacity rather than a specific bounded event.
basal biological identity	Maintained organism–environment distinction produced through dynamic boundary regulation, metabolism, repair and regulated exchange; not a psychological self.
basal biological valuation	Framework term for state-dependent differential biological organization according to consequences for a bounded living organism; does not imply conscious judgment, preference or inner evaluator.
behavioural simulator	System that reproduces selected consciousness-like outputs through a different internal causal organization and therefore does not satisfy the strict zombie identity stipulation.
biological / neuroplastic stabilization	Candidate longer-term biological embodiment of an altered recruitment pattern through repeated operation; explicitly not yet a completed mechanistic explanation of durable Insight.
biological commitment	Transition into a new organismic configuration with consequences, constraints and restoration requirements; does not imply conscious choice or deliberation.
biological components / physical implementation	Established molecular, cellular, tissue and organismal mechanisms through which the proposed Stochastic Pump is physically realized; no component is the Pump by itself.
biological decomposability	Requirement that each proposed Pump contribution be traceable to independently measurable physical operations rather than left as an irreducible systems label.
biological memory	Present physical state shaped by a prior event and capable of altering a later response; explicitly not recollection, representation, autobiographical continuity, or conscious access.
biological registration	Limited biological sense in which an external change produces a differentiated, consequential alteration within a living system; does not imply recognition, representation or an observer.
biological valuation	Organism-relative differential biological treatment of disturbance according to current condition, maintained organization, regulatory requirements and available responses; enacted rather than consciously judged.
bounded organism-relative biological state-transition	Constrained mapped biological event involving consequential registration, persistence, integration, organism-relative valuation, temporal development and resolution into an altered organismic state; proposed unit to which phenomenology is mapped.
broad suppression	Perturbation class in which consciousness-capable integration/complexity is extensively disrupted; must not be defined merely by immobility or absent report.
candidate biological constraints	Provisional constraints defining the biological event class to be tested: living bounded organization, a causally coherent event-level transition, organism-relative differentiation, temporally organized integration/transformation, and resolution/incorporation. They are not claimed as already demonstrated universal necessary and sufficient conditions for phenomenology.
candidate minimum organization	Current proposed minimum bounded-event architecture: selective registration, persistence, integration with present condition/history, organism-relative valuation, coordinated transformation/commitment and biological resolution; explicitly provisional rather than established sufficient law.
candidate model-space summary	State-specific scalar summary such as S_{ana}(t) or S_{rum}(t) used within an operational anchor model; not a coordinate of the complete biological event and not a measure of amount of consciousness.
causal efficacy without independent controller	Material self-referential states can alter later organismic conditions and behaviour without positing an additional inner agent outside the causal system.

central conflation	Compression of primary phenomenology, access, recognition, memory, introspection, ownership, reconstruction and report into one undifferentiated category of subjective experience; Section 14.3 separates these as related but non-identical operations.
choiceless awareness	Proposed ongoing organism-relative phenomenal presence in which thought remains biologically available but unnecessary psychological-time cognition is not compulsively reinstated; not a chooser deciding not to choose, a separate witness, or permanent cognitive absence.
circumstantial dissolution	Proposed episode-specific collapse of an evaluator–evaluated division when its presently concealed organism-relative generating relation becomes directly evident; distinct from broader durable Insight.
cognitive recruitment	Transition through which a present external or internal condition makes a memory-dependent representational operation available for recognition, comparison, imagery, language, prediction, planning, communication or later action.
comparative boundary case	Organism/system selected to test how far the proposed organizational criteria extend while withholding an a priori attribution of phenomenology; the Venus flytrap is the manuscript's principal non-neural boundary case.
comparative constraint	Use of a non-neural boundary case to force explicit inclusion/exclusion criteria without treating the case as proof of phenomenology.
comparison condition	Empirical control/state that may share reports or surface features with Insight while differing in initiating mechanism, effort, persistence, preserved capacities, trajectory and dependence on method/substance/context.
complete anchor / prospectively declared full anchor model	The full operational anchor model prospectively designated for confirmatory testing within a model generation; explicitly not the complete bounded biological event.
complete attention	Undivided present organism-relative awareness in which active thought operating through psychological time is absent while phenomenology and biological responsiveness remain.
completeness of reorganization	Whether the governing relation itself becomes nonviable rather than merely one content within it changing; distinct from total erasure of historical pathways.
component-only Pump model	Comparator using the prospectively retained constituent biological component information without explicit Pump coordination, phase-ordering, recovery or disengagement terms.
conceptual re-creation	Recursive reconstruction of a psychological discrepancy, its apparent owner/evaluator and projected resolution through psychological time, preventing the represented endpoint from functioning as a fixed external terminating condition.
condition of access	The standpoint/mode under which one organized event is encountered or measured—externally through biological variables or organism-relatively as phenomenology—without implying two separate occurrences.
conditional support	Evidential relation whose interpretation depends materially on agent, dose, task, population, state definition, physiology or measurement method.
conditioned image	Memory-, label-, expectation- and history-dependent reconstructed representation through which narrator-level recognition occurs; not a claim that perception is a literal static picture stored in the brain.
conditioned narrator	Later recursively maintained narrator-level self-reference organized through retained history, social attribution, language and anticipated future.
conditioned self-representation	Dynamic organization of bodily information, affective responses, remembered events, social evaluations, roles, possessions, relationships and anticipated consequences.
constitutive inside aspect	The framework's claim that organism-relative phenomenology is an aspect of the complete relevant biological event, so subtracting it changes the event rather than merely removing an additional output.
constrained energetic relation	Proposed non-scalar relation in which biological work is necessary and can covary with intensity, but total energy expenditure alone does not determine phenomenal magnitude, quality or valence.
constraint through negation	Proposed Insight mechanism in which an operative incompatibility becomes directly evident and a previously governing organization loses viability; not verbal denial, suppression, erasure, or a competing controller defeating the old organization.
controlled destabilization	Regulated departure of selected biological variables from maintained conditions during commitment/transformation without catastrophic loss of wider viability.
controlled perturbation	Temporary, regulated departure of selected biological variables from prior conditions as part of an organized event, without implying uncontrolled destabilization.
convergent support	Distinct non-interchangeable methods implicate a related theoretical construct while preserving their measurement differences.
corrected explanatory target	Primary target of the consciousness mapping: phenomenology itself as the organism-relative inside view of the relevant bounded biological event. Recognition, ownership, autobiographical interpretation and report remain legitimate downstream targets rather than constituents silently built into phenomenology.

counterfactual projection	Construction of an alternative possible event that is not presently occurring, including imagined alternatives to past or future situations.
criterion-only / shortcut benchmark	Variable participating in target-state definition may be reported as a benchmark but is not an independent predictor of that same criterion and must not be counted as biological confirmation.
cross-anchor construct invariance	Requirement that any construct claimed to be shared across anesthesia and rumination retain the same prespecified theoretical meaning while allowing state-specific manifestations; changing construct meaning after results constitutes failure/new model generation.
cross-domain prediction architecture	Prospective three-part prediction structure keeping biological measurement representation, independently characterized primary phenomenology, and L2/access outcomes analytically separate; not one undifferentiated Friction-Signature state-space.
cross-level organization	Causal interaction across molecular, cellular, tissue and organismal scales in which higher-level conditions constrain recruitment without replacing molecular mechanisms.
cross-method construct validity	Requirement that different instruments preserve a prespecified relation to the same theoretical construct without assuming numerical interchangeability or identical raw direction.
dark system	Shorthand for a stipulated organism/system lacking the organism-relative inside view; not a synonym for anesthesia, coma, absent report or reduced self-reference.
decomposition, not denial	Methodological/architectural principle that correcting the Category Error retains phenomenology and the real biological/representational functions of memory retention/reconstruction, memory representation, ownership, introspection, action regulation and report while rejecting only the inferred independent owner or controller.
demand-responsive cognition	Cognition recruited by a presently unresolved practical, organismic or environmental requirement and capable of terminating when that requirement is resolved.
differential relevance	Conditioned differentiation through which content becomes more or less capable of recruiting further cognitive operation; broader than explicit verbal valuation.
direct perception	Framework term for an operative relation becoming presently evident such that the organization through which it had been interpreted may lose governing viability; not conceptual agreement, introspective report, or an act by an independent perceiver.
direct state-level support	Proposed observable measured during the target condition against an appropriate reference; does not automatically establish direct measurement of the theoretical construct assigned to that observable.
disconnected consciousness	Loss of ordinary external connectedness/response with possible internally generated experience; boundary condition against equating unresponsiveness with phenomenal absence.
dissociation	Partial separability of phenomenal presence, ownership, agency, memory, behavioural response and report under perturbation or pathology; does not imply fully independent systems.
distortion / fragmentation	Perturbation class in which coordination among ownership, agency, salience, embodiment, memory or self-location is reorganized without simple global suppression.
distributed coordination	Candidate network/system-level reorganization in how formerly governing content interacts with salience, memory, prediction, self-reference, conflict, affect and action; not a single universal connectivity signature.
division as concealment	Framework claim that organism-relative significance is encountered in the completed condition while the relation generating that significance recedes, and that recursive evaluator–evaluated division elaborates this concealment.
domain-specific psychological Friction Signature	Multidimensional trajectory associated with recursive psychological amplification in a prespecified domain; indexed to target/scope and not generalized automatically to the whole organism.
downstream narrator	Narrator-level recognition/ownership is proposed to arise after sufficient primary processing and therefore cannot be the primitive pre-existing experiencer.
drastic attenuation	Large reduction in the complete response trajectory—duration, recurrence, recursive persistence, biological amplification and recovery burden—not necessarily a uniformly smaller initial peak.
dual-anchor quantitative operationalization	First-generation quantitative programme using anesthesia suppression/reorganization and sustained rumination/perseverative recursion as complementary perturbational anchors; the anchors constrain the same Mapping architecture without forming one consciousness-magnitude scale.
dynamic narrator continuity	Apparent self-continuity generated by recurrent updating and indexing of changing remembered/anticipated content rather than persistence of an invariant self-substance or archive.

dynamical rumination component	Method-specific construct covering stability, flexibility, recurrence, dwell and related neural dynamics; distinct from thermodynamic entropy and from both N and T_bio, with incremental validity required.
effortless silent interval	Interval without psychological-time cognition proposed to arise from absence of unnecessary recruitment rather than continuous concentration, suppression or monitoring.
emerging support	Evidence that remains limited, heterogeneous, weakly replicated or not yet organized around a stable construct.
empirical convergence of selfhood components	Cross-paradigm pattern in which ownership, self-location, agency/authorship, self-prioritization, meta-awareness and narrative selfhood are experimentally manipulable or dissociable; convergence supports decomposability, not any one experiment proving the virtual-variable account.
empirical trajectory	Temporally structured unit of analysis following recruitment, interpretation, ownership, further cognition or termination, biological amplification, behaviour, recovery and later context-dependent retest.
enabling model	Alternative in which biology supplies conditions for some further process that gives rise to phenomenology.
endpoint homology	Requirement that compared recovery timings/trajectories refer to genuinely corresponding biological, behavioural, cognitive, mnemonic or report endpoints.
event-specific recruitment	Selective redistribution or engagement of maintained support processes around a particular bounded transition; distinct from baseline maintenance.
evidence maturity	Degree of empirical support for a component or model; does not itself determine theoretical importance, fixed weights or final parameter values.
evolutionary continuity	Possibility that relational components of the proposed organism-relative architecture arose before human-like narration, without implying phenomenal sameness or universal continuity.
Explanatory Remainder Test	Test asking whether a fully specified bounded biological event still requires an additional independently operating recipient, translator, observer or phenomenal mechanism.
explanatory residue	A remaining entity, function, relation or bridge to which explanatory work would still have to be assigned after the architecture is specified. Section 14.6 argues that the primitive observer/owner/controller performs no such unassigned role within the defined subject–experience architecture.
failure of expression	Loss or impairment of behavioural/verbal output while relevant internal organization may remain present; contrasted with failure of the organism-relative event itself.
false division	Apparent psychological separation in which a thought-generated virtual evaluator is experienced as standing apart from the process/state it evaluates while organism-relative significance generated through the organism–event relation appears to belong to the evaluated event itself. The external event need not be unreal; the falsehood concerns the inferred psychological separation and misplaced origin of valuation.
feedback	Re-entry of recursive interpretation/attribution into the organism, altering biological conditions from which subsequent organism-relative events develop.
final Section 18 status	Falsifiable biological mapping architecture with initial dual-anchor quantitative operationalization and a defined path toward prospective validation; not a completed identity proof.
final untouched holdout	Evaluation data excluded from model construction, feature selection, transformation fitting, threshold tuning and other target-informed development operations until the confirmatory test.
focused practical attention control	Sustained, goal-directed cognition used as a high-value dissociation comparator to test whether the biological model merely detects cognitive effort, internal attention, duration, arousal or executive recruitment.
foundational Friction Signature measurement families	Four introductory empirical families: local heat production; metabolic recruitment; autonomic regulation/allostatic burden; entropy production or integrated metabolic cost. Not exhaustive or orthogonal final state-space axes.
Friction	Framework term for recursive resistance, contradiction, anticipated threat, unresolved comparison, and protection of conditioned self-representation.
Friction Signature	Externally measurable, multidimensional and temporally organized biological profile associated with event-specific Stochastic Pump recruitment; evidential trace, not the Pump, event or Glow itself.
functional attribution	Real organismic indexing of perception, memory, valuation, thought or action to a first-person reference (I, me, mine). Its causal/functional reality does not by itself establish an independently existing bearer standing outside or prior to the process.
functional meaning of retained content	What an accessible memory/representation continues to organize—expectancy, affect, behaviour, conflict and recursive recruitment—distinguished from mere content retention.
functional resetting	Re-establishment of the organization required for renewed availability without requiring exact reversal of the preceding physical microstate.

functional self-reference	Conventional indexing of information, action, memory, commitment, condition or responsibility to a particular organism/person without thereby positing an independently existing psychological owner behind the reference.
general Mapping-strategy failure	Repeated strong prospective failure across independently characterized states, perturbations, boundary cases and increasingly complete locked models sufficient to require major revision of the central empirical Mapping strategy.
General Organism-Relative Identity Proposition	Central hypothesis that, for the relevant bounded organism-relative state-transition, externally measurable biological organization and phenomenology are two access conditions/aspects of one organized occurrence rather than two separately instantiated events.
global suppression lower comparison	Negative-control condition in which reduced thought arises because consciousness-capable/practical cognitive organization is broadly suppressed rather than selectively reorganized.
Glow	Shorthand for the organism-relative phenomenal aspect of the same event denoted externally as the Grind; not literal heat, luminosity, or a second product.
governing viability	Capacity of an interpretive/recursive organization to continue operating as the authoritative structure through which present experience, evaluation, ownership and response are organized; Insight is proposed to constrain this viability when the causal relation on which the organization depends becomes directly evident.
graded covariation	Prediction that biological and phenomenal dimensions vary in structured, partially dissociable patterns rather than along one scalar “more/less consciousness” axis.
graded perturbation	Empirical strategy comparing amplification, selective attenuation, distortion/fragmentation and broad suppression rather than placing all states on one scalar consciousness axis.
Grind	Shorthand for the complete organized biological state-transition under externally measurable conditions of access; not a separate substance or a producer that converts into phenomenology.
haemodynamic proxy	Blood-flow/BOLD measure that tracks aspects of neural–vascular recruitment but is not a direct measurement of total ATP turnover, heat production or complete event cost.
haemodynamic recruitment	Changes in blood-flow/BOLD-related support accompanying neural activity; informative but not direct measurement of ATP turnover, heat or total metabolic cost.
historical predictive-program quarantine	Publication-facing exclusion of superseded predictive equations, scaling constants, suppression factors, recursive-overhead parameters and universal energetic thresholds unless freshly defined, derived, verified and prospectively validated.
Identity Resolution	Organized biological resolution through which organism state changes relative to a consequential perturbation; broader than overt movement.
identity-level entailment	Conditional consequence of the proposed event-level identity: if primary phenomenal states genuinely differ, their corresponding complete bounded biological events cannot be identical in every identity-relevant respect. This does not imply that any current measurement model must already detect the relevant difference.
immediate functional reorganization	Proposed near-term loss of governing authority and altered recruitment/transition pattern before any claim of large-scale anatomical change.
immediate implementation	Event-specific support processes recruited during a particular bounded transition.
independent state-identification criterion	Prespecified evidential criterion used to classify or contrast candidate phenomenal states independently of the biological predictor being tested; it may use report, psychophysical, behavioural, clinical or validated no-report evidence according to the paradigm, but none is treated as transparent access to phenomenology.
inside view	Organism-relative phenomenal aspect of the organized biological event; not a spatially located inner observer, introspective representation, behavioural report, or narrator-level ownership.
integrated energetic cost	Systems-level target combining relevant energetic work across readiness, event-specific recruitment and restoration; not directly supplied by a single BOLD, glucose, oxygen or heat measure.
internal validation	Performance estimation within development data using properly contained resampling in which every target-informed operation is nested inside the resampling procedure; distinct from a final untouched holdout and from external validation.
internally generated stimulus	Remembered, imagined, anticipated, or self-referential content that is physically instantiated in present processing and can alter current organismic state despite absence of the corresponding external event.
invariant architecture / variable content	Distinction between the proposed common causal structure of self-generation and the organism-specific fears, roles, attachments, ambitions, beliefs, relationships, or other content through which that structure is recruited and may become evident.
invariant domain dictionary	Prespecified mapping of shared domain labels to invariant theoretical meanings, allowed state-specific manifestations, prohibited semantic changes, eligible

	measurement families, construct-validity criteria, and explicit invariance-failure conditions.
learned regulation	Reduction of a response through retrieved cognitive/physiological strategy, monitoring or active control while the original organization may remain viable.
least inclusive causally coherent level	Proposed event-boundary criterion selecting the smallest biological scale at which registration, operative persistence, integration, differential organization, transformation and resolution form a coherent whole.
looking to find out	Inquiry directed toward observing the actual operation without beginning from a protected conclusion, promised psychological reward, or projected attainment; not an anti-method identity or guarantee of Insight.
lower perturbational constraint	Reversible, agent- and endpoint-specific, dissociation-sensitive test of whether perturbing a prespecified candidate biological organization produces the predicted changes across independently characterized phenomenal states and downstream access functions. It is not a scalar amount of "lower consciousness" and does not by itself prove identity.
Magnitude Threshold	Framework threshold $$M_\theta$$ at which relevant accumulated activity is sufficient for the corresponding bounded state-transition to complete; not claimed universal across events.
maintenance-and-restoration continuity	Overlapping biological work operating before, during and after a bounded transition to preserve readiness, support recruitment and restore or reorganize future availability.
malformed question	A subject–experience formulation that inserts the downstream apparent experiencer into the explanatory starting conditions before the biological generation, temporal position and ontological status of that subject have themselves been explained.
Mapping Theorem	Framework name for the proposed falsifiable event-level identity relation between primary phenomenology and the complete bounded organism-relative biological event; the label does not imply that strict identity has already been mathematically proved or prospectively validated.
matched verbal knowledge	Experimental comparison condition in which explicit conceptual understanding is held as similar as possible while governing organization/trajectory is tested separately.
material resolution	Termination of a practical discrepancy through an independently updateable relation, action, measurement, correction, evidence or completed obligation.
mechanical registration	Entry stage in the flytrap case whereby qualifying trigger-hair deformation is converted into local electrical/calcium change capable of entering wider signalling.
meditation (structural definition)	The silent interval of present organism-relative awareness without active thought through psychological time; distinguished from any posture, mantra, breathing technique, concentration method, or other practice intended to facilitate it.
meditative absorption without demonstrated reorganization	Meditation-related state with altered attention/self-reference or reduced narration whose durability and effect on governing recruitment remain unestablished after the state ends.
memory representation	A representation generated by present biological reconstruction from retained information. The present reconstructive process and resulting representation are real and can have present causal consequences; the past event represented is not thereby physically reinstated. Remembered past and imagined future are both present representations of non-present temporal referents, although only the former may refer to an event that actually occurred.
multidimensional biological trajectory	Event-relative profile preserving onset, location, magnitude, duration, recurrence, coupling, phase order and recovery rather than reducing evidence to one peak/scalar marker.
multidimensional Friction Signature	Convergent organism-level predicted profile spanning metabolic, autonomic, network, heat and thermodynamic dimensions associated with sustained recursive recruitment; not a single biomarker.
multidimensional scaling	Comparison across distinct capacities such as differentiation, integration, temporal depth, recurrence, flexibility, representational reach, ownership and reportability rather than one scalar "complexity."
narrative identity	Socially and autobiographically extended organization of personal history around a recurring self-reference.
narrative ownership	Later recursive representation of an event as happening to "me"; distinct from phenomenal presence itself.
narrative self	Autobiographically extended self-organization through which changing events are represented as belonging to a temporally continuous "me."
natural attention	Present organism-relative awareness proposed to remain when unnecessary recursive cognition is not being recruited, without continuous correction by a virtual controller.
natural dissolution	Proposed termination of residual thought because no actual demand supplies recursive amplification, without deliberate rejection or controller-mediated suppression.

necessary but not sufficient	The Stochastic Pump is proposed as functionally necessary physical support for the Grind, while Pump-level support considered apart from the complete event is insufficient to specify the Glow.
nested events	Legitimate descriptions at action-potential, closure-sequence and complete capture-cycle scales; the appropriate boundary depends upon the phenomenon under investigation.
network-only rumination core	Prospectively declared intended core when no valid criterion-independent biological temporal component is justified before confirmatory testing; distinct from a missing-data reduced implementation.
neural lower boundary	Proposed organizational threshold introduced by nervous-system architecture that would be necessary for phenomenology itself rather than merely for differentiation, access, ownership or report.
new model generation	Status assigned when variables, definitions, transforms, component meanings, weights, thresholds or other material model rules are changed after a locked confirmatory result; the revised model requires new independent validation and does not retroactively rescue the failed model.
no neutral computational standpoint	Framework proposition that cognition in a bounded living organism is recruited through an already history-, state-, learning- and relation-dependent organization rather than from an organism-independent informational perspective.
non-neural organism	Living system lacking neurons/nervous tissue; used for comparative testing without assuming absence or presence of phenomenology by anatomy alone.
nonequilibrium maintenance	Continuous energy-dependent preservation of gradients, distributions and regulatory conditions that would otherwise decay and that make later biological responsiveness possible.
observer is the observed	Framework formulation that the apparent observer is a recursively generated reference point within the same biological/representational process whose conditioned reconstruction it takes as its object; does not mean the organism is literally identical to the external tree or object.
occurrence–access distinction	Distinction between the organism-relative event occurring and later availability of that event to metacognition, global access, ownership or report.
ontological identification	Interpretive move in which a self-reference is treated as a separately existing psychological thinker, owner, evaluator or controller rather than as a functional organism-relative index generated within biological/cognitive activity.
operational vulnerability	Requirement that proposed inclusion/exclusion boundaries generate perturbational, dissociative and recovery predictions capable of empirical failure.
ordinary spontaneous cognition	Baseline internally or externally initiated cognition in which one content item can recruit another, spanning practical, autobiographical, creative, semantic and anticipatory forms without being uniformly pathological.
organism-relative awareness	Awareness/registration organized relative to the condition and requirements of the particular living organism, prior to mature narrative ownership.
organism-relative calibration	Prespecified calibration of operational biological measures relative to an appropriate participant-, state-, population- or externally defined reference while preserving the distinction among those reference classes and preventing confirmatory-holdout leakage.
organism-relative differentiation	Unavoidable differentiation of conditions through the bounded organism's biological history, present state, learning and available responses; does not by itself require a mature psychological evaluator.
organism-relative identity constraint	Framework proposition that the complete relevant organism-relative biological event and its organism-relative inside view are aspects of the same event rather than separable event plus optional phenomenal output.
organism-relative index	Common reference coordinate around which bodily state, history, action possibilities and anticipated consequences are repeatedly organized; proposed precursor to temporally extended narrator-level self-reference.
organism-relative inside view	Phenomenology considered as the inside aspect of the same organized organism-relative biological process, distinct from later narrator-level recognition, ownership, autobiography, or report.
organism-relative reference	The recurring reference by which changing conditions, memories and possible actions are organized relative to the same living organism.
organism-relative registration	Biological registration of internal/external change relative to the organism’s present state and possible action.
organism-relative shorthand	Explanatory phrases such as “this matters to me” or “resources for me” that denote biological significance relative to organism state/history/action possibilities without attributing literal propositions or a narrator.
organism-relative valuation	Non-neutral biological significance of a condition or event for regulation, viability, threat, opportunity or action; not narrator-level reflective judgment.
organismic control	Distributed causal regulation across perception, memory, valuation, prediction, inhibition and action; contrasted with an independent internal controller.

Organizational Covariation Test	Test of whether targeted changes in specified biological dimensions produce the predicted changes in corresponding phenomenal dimensions rather than undifferentiated more/less consciousness.
oriented performance function	Prespecified P(M) whose orientation makes larger values indicate better performance under the primary evaluation criterion, permitting coherent incremental comparisons.
paired-anchor architecture	Candidate integration of independently tested anesthesia and rumination anchor models under frozen shared-domain meanings and common validation rules; not an established common biological state-space.
paired-architecture failure	Level-5 failure in which both anchor models may remain individually useful while frozen shared-domain meanings, invariance rules, or cross-anchor Pump meaning fail.
partial failure / dissociation	Selective impairment of components or phases such that some registration, propagation, integration, access, output or recovery relations remain while others fail.
partial reorganization	Change affecting some content or components of a domain while wider ownership, certainty-seeking, self-security or recursive recruitment remains capable of shifting to related content.
past-tense perspective	Framework description of narrator-level access as necessarily referring to an event that has already undergone sufficient processing for recursive availability; does not imply causal inertness.
phenomenal character	The differentiated form/content of the phenomenal event, such as pain, colour, anxiety or bodily dislocation.
phenomenal intensity	Framework dimension of the organism-relative Glow attributed to the magnitude and organization of the complete bounded biological resolution; not an internal readout of metabolic cost.
phenomenal presence	Whether an organism-relative inside view occurs at all; distinct from phenomenal character, intensity, ownership and reportability.
phenomenal sufficiency	Condition sufficient for an organism-relative inside view; explicitly not claimed to have been empirically established by the current candidate architecture.
phylogenetic hierarchy	Proposed ordering from basal organism-relative regulation through candidate L1 integration to L2 recursive ownership/report; architectural ordering, not a claim that all lineages pass through identical forms.
phylogenetic scaling	Comparative organization of basal regulation, organism-level integration and recursive self-reference across evolutionary complexity; not a literal plant-to-animal ancestor sequence.
physical process / virtual owner	Structural result distinguishing materially implemented recursive self-reference from the additional independent owner represented by that process.
physical support architecture	Distributed biological maintenance, event-specific recruitment, controlled perturbation, coordination, containment and restoration that make bounded state-transitions physically possible while remaining distinct from the transition itself.
post-resolution continuation	Cognition that persists after a practical requirement has been materially resolved through rehearsal, self-evaluation, imagined alternatives or unrelated association.
practical stopping condition	Independently resolvable practical relation that can terminate task-relevant cognition when measurement, action, communication, correction or other present requirement is completed.
present internal stimulus	Current representational content—remembered, imagined, predicted, desired or feared—that is itself a real present cognitive process and can alter present biological/cognitive conditions despite the represented event being absent.
preserved practical individuality	Retention of learned motor, professional, social, linguistic and practical capacities despite reduced psychological appropriation by the virtual narrator.
prevailing recursive organization	The currently governing organization through which present content is assimilated and made coherent under the organism's accumulated history and present conditions; not necessarily an explicit belief or consciously chosen theory.
Primary Integration Layer (L1) / Resolution Engine	Functional organism-relative level of primary registration, valuation, integration and resolution whose proposed inside view precedes narrator-level ownership/report; not one anatomical location.
primary phenomenology	Phenomenal occurrence attributed to the primary organism-relative biological event prior to later recognition, autobiographical attribution, introspection, or report.
primitive observer	The antecedent subject/owner implicitly treated as already present to receive, possess, observe or report phenomenology. Section 14's empirical exclusion applies specifically to the defined narrator-level bundle of recognition, attribution, ownership, introspection and report; it does not purport to experimentally disprove every conceivable metaphysical subject.
process-level description	Systems-level description of coordinated relations among established components without positing an additional substance or hidden mechanism.

product conceals its production	Narrator-level representational reversal in which perception, thought, memory and action become available already indexed as mine, making the downstream reference point appear antecedently prior. It is not merely ignorance of hidden neural machinery and does not replace the more primitive organism-relative concealment developed elsewhere.
production model	Alternative in which a biological event causes phenomenology as a distinct downstream result.
prospective model validation	Evaluation of a frozen, prospectively declared biological measurement model on independent data not used to define, select, transform, weight, calibrate or tune that model; distinct from retrospective literature alignment and component-level support.
psychedelic ego attenuation	Pharmacologically induced alteration or reduction of ordinary ego/self-boundaries and narrator coherence, distinguished from durable loss of self-generating authority.
psychological becoming	Recursive movement in which a present state is represented as insufficient, a desired future state is projected, and method/effort is organized around anticipated psychological attainment.
psychological suffering	Framework term for recursively sustained conflict in which present or represented content is appropriated by the virtual reference point as belonging to an independent owner/evaluator/sufferer and is prolonged through psychological time, defence, condemnation, comparison, resistance, becoming or self-security; explicitly not identical to pain, grief, fear, trauma or every prolonged biological disturbance.
psychological time	Temporal organization intrinsic to memory-dependent conscious thought in which retained material becomes active within present processing; not limited to explicit past/future thought or self-reference.
Pump-coordination model	Model using the same underlying component information while adding prespecified cross-component relations, temporal/phase ordering, and recovery/disengagement structure; must earn incremental independent value after complexity penalty.
Pump–event distinction	The Stochastic Pump denotes distributed maintenance/recruitment/restoration work; the bounded event is the particular organism-relative transition in which selected maintained capacities are recruited.
recovery hierarchy	Proposed ordering in which consciousness-capable biological organization can recover before later access, retention, ownership, orientation, executive control and report are fully restored.
recruitment magnitude	Magnitude or cost of Pump-related biological recruitment; not a scalar measure of phenomenal intensity, differentiation or richness.
recruitment organization	Conditioned organization governing whether arising content acquires sufficient relevance and amplification to recruit further cognition; distinct from the mere presence of a thought or residual pathway.
recurrence	General causal relation in which earlier activity alters what occurs next; broader than memory-dependent conscious recursive cognition.
recurrence without authority	Reappearance of a representation or perceptual appearance without restoration of its former status as the governing interpretation.
recursive amplification	Repeated L2 evaluation/reconstruction generating present internal stimuli that re-enter and reorganize subsequent L1 conditions, potentially prolonging the event trajectory.
recursive evaluation	Later evaluation that relates present content to retained history, identity, comparison, anticipated consequence and continuity of "me."
recursive generation of narrator	Framework derivation in which thought operating through psychological time and repeated organism-relative indexing generates/updates the narrator rather than being initiated by an antecedent thinker.
recursive load	Sustained/recurrent biological demand produced when retained history, anticipation, comparison or self-referential evaluation repeatedly reactivates processing beyond the initiating stimulus.
recursive narrator	Distributed secondary biological organization through which memory, language, comparison, anticipation, attribution and repeated self-reference reorganize events already occurring within the organism.
recursive ownership	Human L2 organization through which aspects of an event are attributed to a virtual autobiographical reference point as something seen, felt, done, or undergone by "me."
recursive recruitment	Present memory-dependent or reconstructed content functioning as present biological input capable of recruiting another or continuing organism-relative transition.
recursive reorganization	Proposed Insight-related change in which a previously governing recursive organization loses viability while its former content may remain available as memory; distinct from simple content acquisition, erasure, suppression, or replacement by a competing belief.
recursive-audit capacity	Framework capacity arising from retained biological history, reactivatable thought and organism-relative valuation; distinct from active recruitment of the audit.

reduced compulsory cognitive occupation	Predicted reduction in unnecessary initiation/elaboration/continuation of thought while memory, planning, language, problem-solving and adaptive cognition remain available.
reduced implementation	Incomplete implementation of an already-declared model because one or more required measurements are unavailable; requires explicit membership, calibration and validation.
reference-point category error	Framework error of reifying the functional organism-relative reference/index as an independently existing thinker, witness, owner or experiencer and projecting it backward into the event it later attributes to itself.
renewed functional availability	Restoration of conditions sufficient for new registration, integration and response after a consequential transition.
renewed/reorganized functional availability	Sufficient restoration or reorganization for later consequential transitions to remain possible without requiring exact return to the prior microstate.
reorganized tendency	Proposed durable change in the probability and continuation of unnecessary cognitive recruitment across later conditions, distinguished from a temporary silent state.
reportability	Availability of an event for behavioural or linguistic expression; evidentially useful but not identical to phenomenology.
reporting model	Alternative in which the measured process makes an already occurring phenomenal state available to memory, ownership, behaviour or speech.
residual pathways	Retained learned, mnemonic, bodily or self-referential pathways that can remain biologically available after reorganization; later activation does not by itself show restoration of prior governing authority.
resolution	Active restoration or reorganization of event-altered biological conditions such that the organism stabilizes or regains capacity for a further bounded event; distinct from visible output ending.
retained biological history	Persisting effects of prior events—including altered dispositions, learned associations and accessible representations—that can shape later processing.
retrospective authorship	Inversion in which a recursively generated self-reference is experienced as the antecedent author of thought or action whose biological generation preceded narrator-level attribution.
reversed authorship	Causal inversion in which historically generated and presently maintained cognitive activity is attributed retrospectively to the virtual reference point as though that reference independently initiated it.
rumination anchor / sustained recursive-load anchor	Second state-specific anchor testing whether independently characterized sustained rumination has a reproducible biological trajectory distinguishable from matched non-ruminative cognition; not an upper point on a consciousness scale.
ruminative-anxiety comparator	Illustrative recursively sustained condition predicted to show prolonged recurrence, self-related network recruitment and autonomic/allostatic burden; not reducible to one biomarker.
same-target independent validation	Independent evaluation of the same prespecified target construct under sufficiently comparable operational criteria before broader cross-task, cross-population or cross-state transfer claims are made.
scope of reorganization	Range of contexts, contents or expressions over which the same perceived causal relation had governed and no longer retains authority; not a spiritual grade or rank.
Secondary Audit Loop (L2) / Recursive Audit Layer	Distributed memory-dependent recursive organization for recognition, comparison, projection, attribution, autobiographical continuity and report; not a separate observer.
secondary autonomic amplification	Prolongation or reactivation of organismic response through recursive self-referential interpretation after an initial cue response has occurred.
selective attenuation	Perturbation in which narrator-level/self-referential organization is reduced while primary sensory, bodily or affective phenomenology remains available.
selective cognitive flexibility	Predicted ability to move from silence into demand-responsive cognition and back to silence after resolution while practical capacities remain intact; distinct from generalized cognitive quieting.
selective recruitment	Predicted preservation of cognition when actual demand exists together with reduced unnecessary recruitment when no independently resolvable demand remains.
Self Security Loop	Recursive feedback organization in which present, remembered, or anticipated content is evaluated relative to the conditioned self-representation; the evaluation changes organismic state, and that changed state shapes subsequent attention, memory, anticipation, and self-referential evaluation.
self-generating movement	The historically accumulated and presently recurrent organization through which memory, language, evaluation, ownership, comparison, psychological time and social attribution generate and maintain the virtual reference point that is later represented as their independent author.
self-prioritization index	Empirical processing advantage conferred by arbitrary self-association; used as evidence that self-reference can operate as an assignable selection index.

self-protective narration	Recursive interpretation, justification, rehearsal or projection organized primarily around protecting, repairing or stabilizing the virtual psychological centre.
self-security recruitment	Recruitment of belief, status, relationship, possession, achievement, reputation, identity, certainty or projected transformation to stabilize the virtual psychological reference point; distinct from practical organismic security.
sensory differentiation	Degree and diversity with which an organism distinguishes external and internal variables through specialized receptor/pathway/integrative organization.
shared event scaffold	Recurring organization of maintained readiness, registration, propagation, persistence, state-dependent integration, biological valuation, commitment, transformation, energetic/regulatory consequence, resolution and renewed availability across differing living substrates; does not imply identical mechanism or phenomenal content.
shared organization / recurrent biological relation	Comparable causal relation instantiated across different living substrates without implying anatomical identity, homology, equal capacity, or equal phenomenal character.
shared-domain projection	Separately specified and validated rule required before direct numerical comparison of complete anesthesia and rumination trajectories; bookkeeping pairing alone does not define a common metric geometry.
silence	Absence of active thought operating through psychological time while present organism-relative awareness remains; not environmental quiet, unconsciousness, sedation, dissociation, or cognitive impairment.
simpler or restricted model	Prospectively declared lower-complexity comparator/model class; distinct from a reduced implementation caused by missing measurements required by an already-declared model.
stability of reorganization	Persistence of lost governing authority across time and context without continuous monitoring, suppression or effort; compatible with residual content or activation.
stable-perception comparator	Illustrative case with substantial foundational perceptual work but comparatively bounded/non-self-perpetuating recursive re-entry; comparator condition, not universal definition of perception.
state transformation	Coordinated change in the organism's mechanical, electrical, calcium-dependent, metabolic, regulatory and future-response condition; broader than the visible movement alone.
state-specific construction procedure	Prespecified method f_i^(s) for constructing a candidate operational dimension from one or more observed biological measures; its epistemic status and any supervised steps must be declared and confined to development data.
state-specific trajectory	Ordered time series of the transformed components prospectively retained in a declared anchor model; may be unidimensional or multidimensional depending on the prospectively specified implementation and is distinct from the within-window temporal component T.
state-vector (Mapping operational use)	Ordered vector of selected operational variables used in model space to represent aspects of a candidate state; it is not the organism’s complete physical microstate, does not imply exhaustive observability, and does not make heterogeneous components biologically commensurable.
Stochastic Pump	Proposed systems-level organization of distributed energy-dependent biological work through which a living system maintains, recruits, permits controlled perturbation of, coordinates, and restores nonequilibrium gradients and regulatory conditions required for bounded organism-relative transitions under noise, leakage, finite resources, and environmental disturbance; not a force, substance, single anatomical object, or consciousness generator.
stochasticity	Unavoidable physical variability/noise within biological operation, including molecular and channel-level fluctuation; not a substance, force, or claim that randomness is inherently beneficial.
strict identity relation	B_event ≡ P_primary denotes the stronger identity reading that current classification/validation evidence has not empirically established.
strict philosophical zombie	Philosophical stipulation of a complete physical/functional duplicate of a conscious human in which phenomenology is absent; distinguished from behavioural imitation, impaired report, dissociation, anesthesia and other altered biological states.
strong falsification standard	Requirement that convergent failure across the architecture's central selective predictions must seriously weaken/revise the framework rather than be absorbed indefinitely through post-hoc scope or residual-pathway explanations.
structural closure	Architecture-level condition in which every term required by the explanandum has an explicit status, relations among terms are specified, and no residual entity, function, relation or additional explanatory bridge remains necessary. Structural closure is not completion of every empirical measurement or validation of every proposed biological relation.
substrate-indifferent functionalism	Treating formal input-output equivalence as sufficient regardless of living material organization; explicitly rejected by the framework.

substrate-sensitive	The relevant organization depends on its physical implementation and medium; does not imply that one specific anatomy is universally required.
support/event specificity	Pump support can be broadly shared across biological activities; the bounded Grind supplies event-specific organization and therefore cannot be inferred from support magnitude alone.
System Latency	Framework-defined non-zero interval between sufficient primary L1 integration/resolution for an event and its earliest recursive L2 availability; temporal/functional relation, not transmission between two isolated boxes.
Temporal Alignment Test	Preliminary falsification test asking whether onset, change, suppression and recovery of the proposed biological organization align temporally with corresponding changes in phenomenal availability, without equating report timing with phenomenology timing.
Temporal Exclusion Constraint	Framework inference that a narrator-level representation becoming available only after sufficient L1 processing cannot have been the original owner/recipient/antecedent author of that same earlier event.
temporal persistence	Continued biological availability of consequences from an earlier disturbance such that later input acts on an already altered organismic state; not symbolic storage or autobiographical memory.
temporary silence	Interval in which active thought operating through psychological time is absent while present organism-relative awareness remains; by itself does not establish durable reorganization.
thermodynamic work	Material energetic work required to maintain, alter, restore and reorganize nonequilibrium biological gradients and state; necessary for implementation but not identical to phenomenology.
thought as an intermittently recruited instrument	Functional position in which cognition remains available and can operate when a present requirement recruits it, but need not continue automatically after the requirement resolves.
threshold integration	State-dependent interaction of successive biological events whose combined history can carry the system across a transition threshold; preferred over anthropomorphic “counting.”
timeless awareness	Restricted term for awareness not organized through psychological time around reconstructed past and projected self-completion; explicitly does not mean cessation of physical or chronological time.
trajectory-based representation	Primary state-specific temporal representation used where scalar compression would obscure asynchronous, non-monotonic, or state-specific structure; need not be multidimensional in every valid model.
transition probability between unnecessary thoughts	Proposed conditional probability that a current non-demand-responsive thought recruits another unnecessary thought; represented in the source as P(next unnecessary thought | current unnecessary thought).
transportability	Generalization of a frozen model across new populations, laboratories, tasks, equipment, platforms or settings; distinct from internal validation and ordinary participant holdout.
two-level architecture	Architectural distinction between primary organism-relative phenomenology and secondary recursive narration/ownership within one living system; not two substances or isolated streams.
upper perturbational constraint	Complementary Mapping constraint targeting sustained self-referential/perseverative recursive load; “upper” refers only to sustained recursive persistence and does not mean more consciousness, greater phenomenal magnitude, or universally greater biological expenditure.
virtual reference point	Recurring self-reference implemented by real biological/representational processes but not an independently existing inner owner standing apart from those processes.
virtual referent	Apparent unified thinker/owner/observer represented by distributed self-referential processing; distinct from the material biological implementation that generates the representation.
Zero-Remainder Result	Architectural claim that after L1 inside view, L2 recursive organization and their interaction are accounted for, no additional independent owner/witness/experiencer is required.
zombie flytrap	Framework-specific conditional thought experiment: if the complete bounded organism-relative event and its inside view are identical descriptions of one event, a physically/functionally identical flytrap cannot be stipulated to lack that inside view without violating the identity proposition. “Dead” here means loss of the complete living organization relevant to the duplicate comparison, not immediate cessation of every cellular process.

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Steven Tyler Orchid: 0009-0006-0469-6780