

The Conscious Body: Organs as Attractor-Based Minds

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Abstract

The standard view holds that only the brain generates consciousness. This paper challenges that monopoly by applying the minimal functional criteria used to attribute rudimentary consciousness to the 302-neuron nematode *C. elegans* to the body's own complex, intrinsically innervated organs. On the basis of integration, valence, learning, goal-directedness, and anatomical concentration, the enteric nervous system (ENS), the intrinsic cardiac nervous system (ICNS), the intrinsic pancreatic ganglia, and—provisionally—the spinal cord qualify as candidate conscious subsystems. We do not assert that these organs are conscious. We assert that if the functional criteria are taken seriously enough to include a 302-neuron worm as a candidate, they cannot be silently withheld from structurally richer systems without a principled reason. We argue that the brain is not the sole generator of consciousness but the regulator of a federation of semi-autonomous organ-level attractors. We provide testable predictions, sketch the coupling mechanisms that bind local attractors into a unified self, outline clinical implications, and identify open problems including inter-attractor conflict and the phenomenal gap. The framework is offered as a research-generative hypothesis, not a completed theory.

1. Introduction: The Brain's Unexamined Monopoly

The brain is the organ we associate with consciousness, almost without question. Yet the body contains other complex neural networks. The enteric nervous system (ENS) comprises 200–600 million neurons, operates semi-autonomously, learns, and remembers. The intrinsic cardiac nervous system (ICNS) integrates local signals and regulates cardiac output. The spinal cord, with approximately 200 million neurons, can learn when isolated from the brain. The intrinsic pancreatic ganglia coordinate metabolic homeostasis. If these systems were found in a small animal, comparative neuroscience would at least entertain the possibility of consciousness. Because they are inside us, they are dismissed as mere infrastructure.

This paper asks a simple question: if we accept the functional criteria used to infer minimal consciousness in *C. elegans* (302 neurons), why are those same criteria not applied to the ENS, the ICNS, the pancreatic network, and the spinal cord? The question is not *Are these organs conscious?* but *Why are they excluded a priori?*

We do not claim to solve the hard problem of consciousness. We adopt the same pragmatic strategy used throughout comparative neuroscience: observable functional properties—integration, valence, learning, goal-directedness, and anatomical concentration—are treated as operational proxies for consciousness. This strategy is how we infer consciousness in other humans (by analogy), in non-human animals (by behavioural complexity), and in *C. elegans* (by measurable learning and integration). If these criteria are sufficient to identify a candidate conscious system in a 302-neuron worm, consistency demands their application to other systems that exceed this threshold, unless a principled exclusion criterion is provided. That exclusion criterion has not been articulated.

We use the term **candidate** throughout to avoid slippage into positive consciousness attribution. The paper's central claim is that the ENS, ICNS, pancreatic network, and spinal cord are *candidates*—systems that meet the same threshold criteria applied to a known candidate—and that dismissing them without investigation is methodologically inconsistent.

2. The Attractor Framework as Conceptual Scaffolding

An attractor is a region in state space toward which trajectories converge and remain unless perturbed. A candidate conscious attractor possesses five functional properties:

1. **Integration:** binding multiple sensory or interoceptive streams into a unified dynamical state.
2. **Valence:** operationalized as approach/avoidance behaviour—attraction to certain states and repulsion from others. We do not claim that behavioural valence entails phenomenal valence. We claim only that it is the same behavioural proxy used for *C. elegans* and other simple organisms. The inference from behavioural valence to phenomenal valence is a philosophical commitment we note but do not resolve.
3. **Learning:** the capacity to modify behaviour based on experience (habituation, sensitization, associative conditioning).
4. **Goal-directedness:** acting to maintain the system's own basin—a form of conatus—persisting in the absence of external commands.
5. **Anatomical concentration:** a spatially organized, intrinsically connected neural network with dedicated integrative circuitry. This fifth criterion distinguishes concentrated neural attractors (ENS, ICNS,

pancreatic ganglia) from diffuse, non-neural systems (immune system) and from infrastructure networks that lack a defined integrative centre. For the spinal cord, as discussed in Section 4.4, we apply this criterion with qualification.

The attractor vocabulary is applied conceptually, not formally, in this paper. A forthcoming quantitative treatment (Galida, 2026) will develop the mathematical persistence functional. The current paper uses attractor language to structure its functional criteria and predictions; it does not claim to derive formal basin measures from the available data.

Operationalizing Autonomy: We propose, as a provisional operational threshold, that a candidate subsystem crosses the autonomy boundary if it retains a significant fraction (e.g., $\geq 50\%$) of its normal functional repertoire following complete extrinsic denervation or isolation. This criterion distinguishes systems that are merely regulated from systems that can independently sustain goal-directed attractor dynamics. The ENS and ICNS clearly exceed this threshold; the spinal cord and pancreatic network do so conditionally, as discussed below.

3. The Conditional Argument and Its Stipulated Baseline

The nematode *C. elegans* possesses exactly 302 neurons. Its connectome is fully mapped. It exhibits sensory integration, associative learning, goal-directed chemotaxis, and minimal self-reference (distinguishing self-generated from external touch). Its learning capacities are well-documented (Ardiel & Rankin, 2010; Sasakura & Mori, 2013).

We stipulate—we do not establish—that *C. elegans* is a

candidate for minimal consciousness on the basis of these functional criteria. The paper does not require that the field accept this stipulation as consensus. It requires only that the reader grant the conditional: **if** the functional criteria are sufficient to make *C. elegans* a candidate, **then** they must be applied consistently to any system that meets or exceeds them. Those who reject the conditional may ignore the remainder of the argument, but they must then explain what additional criterion excludes the ENS, ICNS, pancreatic network, and spinal cord while admitting *C. elegans*.

4. Candidate Organs

The four candidate organs identified below are assessed against the five criteria, with the provisional autonomy threshold applied where possible. We differentiate their evidential strength clearly.

4.1 The Enteric Nervous System (ENS)

The ENS is the strongest candidate. Its 200–600 million neurons form two interconnected plexuses spanning the gastrointestinal tract. It meets all five criteria:

- **Integration:** continuously integrates mechanical, chemical, and hormonal signals to coordinate peristalsis, secretion, and blood flow.
- **Valence:** exhibits attraction to nutrients, aversion to toxins; noxious stimuli trigger emesis or accelerated transit.
- **Learning:** exhibits habituation, sensitization, and long-term plasticity; gut reflexes can be conditioned (Furness, 2012; Schemann & Frieling, 2020).
- **Goal-directedness:** actively propels food and maintains digestive homeostasis independently of the brain;

peristalsis persists after vagotomy—well above the 50% autonomy threshold.

- **Anatomical concentration:** a continuous, highly organized neural network with dedicated integrative circuitry.

4.2 The Intrinsic Cardiac Nervous System (ICNS)

The ICNS (14,000–43,000 neurons) is a moderate candidate. Its neuron count is only 46–143 times the *C. elegans* threshold, a narrower margin than the ENS. It meets the criteria, but with less evidential richness:

- **Integration:** monitors blood pressure, chamber stretch, and local chemistry to modulate cardiac output.
- **Valence:** maintains a preferred setpoint for cardiac rhythm; arrhythmias represent perturbations from that setpoint.
- **Learning:** shows ganglionic remodelling after injury; vagal stimulation protocols can alter responsivity (Armour, 2008).
- **Goal-directedness:** generates intrinsic rhythms when denervated, satisfying the autonomy threshold.
- **Anatomical concentration:** organized into ganglia on the heart's surface.

The ICNS contributes to emotional experience via heartbeat-evoked potentials that correlate with interoceptive awareness and self-recognition. This is suggestive but does not independently establish consciousness.

4.3 The Intrinsic Pancreatic Network

The pancreatic network is the most provisional candidate. Its 10,000–50,000 intrinsic neurons are scattered in ganglia throughout the organ, rather than forming a continuous plexus (Ahren, 2000; Salvioli et al., 2002). This weaker anatomical concentration distinguishes it from the ENS and ICNS.

- **Integration:** combines neural, hormonal, and nutrient signals to regulate blood glucose.
- **Valence:** maintains a metabolic setpoint; hypoglycemia and hyperglycemia are aversive states.
- **Learning:** plasticity is less studied than in the ENS; no direct evidence of conditioning is available.
- **Goal-directedness:** coordinates endocrine and exocrine output to maintain glucose homeostasis; whether this function persists at $\geq 50\%$ of normal repertoire after complete extrinsic denervation is not yet established. The pancreatic network remains a candidate, but with an open empirical question on the autonomy threshold.
- **Anatomical concentration:** scattered ganglia; meets the threshold but is the weakest candidate on this criterion.

4.4 The Spinal Cord (Provisional Candidate)

The spinal cord possesses approximately 200 million neurons, organized into topographically precise circuits that integrate sensory input, generate coordinated motor output, and exhibit learning when isolated (Hook & Grau, 2007). By the five functional criteria, it qualifies. However, under normal physiological conditions, its activity is tightly coupled to descending commands, and independent behavioural generation is rarely observed. After complete spinal cord injury, the isolated cord reorganizes and can generate complex, goal-directed responses. Whether such reorganization achieves the $\geq 50\%$ autonomy threshold is an empirical question; we provisionally include the spinal cord as a candidate with lower confidence, identifying it as the ideal test case for refining the autonomy criterion.

5. The Brain as Regulator: Mechanisms of Coupling

If the ENS, ICNS, pancreatic network, and spinal cord are candidate conscious subsystems, the unified self must be explained as the product of their integration by the brain. We propose that the brain couples, modulates, and aligns local attractors through four mechanisms, each supported by established physiology.

5.1 Vagal Afferent Signalling

The vagus nerve provides the primary bidirectional communication channel between the brain and the viscera. Vagal afferents convey interoceptive signals from the ENS and ICNS to the nucleus of the solitary tract, and descending signals modulate organ function. Vagal nerve stimulation is known to alter mood, reduce inflammation, and improve cardiac function (George et al., 2000; Tracey, 2002).

5.2 Humoral Signalling

Circulating hormones (cortisol, adrenaline, insulin, glucagon) and immune mediators (cytokines) provide a slower, diffuse coupling channel. These signals alter the global attractor's landscape by shifting the metabolic and inflammatory context. Sickness behaviour—fatigue, anhedonia, social withdrawal—is a well-documented example of immune-to-brain signalling that temporarily reconfigures the global attractor (Dantzer et al., 2008).

5.3 Rhythmic Entrainment

The brain entrains peripheral rhythms to its own oscillations. Cardiac and respiratory rhythms phase-lock to cortical activity during focused attention (Thayer & Lane, 2000). Slow-wave sleep entrains glymphatic clearance (Xie et al., 2013). The brain sets a rhythm, and the organs—each with their

own intrinsic oscillators—tend to follow. This resonance is not command; it is coupling by shared frequency.

5.4 Predictive Processing and Attractor Coupling

The predictive processing framework (Clark, 2013) treats the brain as a prediction engine that minimizes surprise by updating internal models based on sensory input. We suggest that this framework extends naturally to interoception: the brain maintains predictions about the states of the body's organs, and each organ generates its own predictions about local conditions. The alignment of these nested predictive models is functionally analogous to attractor coupling, in that both involve the progressive alignment of internal states toward a shared equilibrium. Friston's (2010) free-energy principle provides a formal bridge between predictive processing and dynamical systems that could, in future work, unite these descriptions under a single mathematical framework.

5.5 Relationship to Competing Theories of Consciousness

The attractor framework is compatible with but not identical to several major theories. Integrated Information Theory (IIT; Tononi, 2008) holds that consciousness is a function of the amount of integrated information a system generates. The attractor framework shares IIT's emphasis on integration but does not require the computation of Φ , which remains technically infeasible for most organ systems. Global Workspace Theory (GWT; Baars, 1988; Dehaene, 2011) posits that consciousness arises when information is broadcast within a global workspace. Under GWT, many peripheral attractors would be considered unconscious because they lack access to a central workspace. The attractor framework allows for phenomenal consciousness without global access, a position consistent with the possibility that the ENS may have experiences that never enter cortical awareness. Higher-Order Theories (HOTs) require meta-representation—the capacity to

represent one's own states—which, if correct, would likely exclude all candidate organs except the brain. The attractor framework treats HOTs as a valid but overly restrictive criterion that would also exclude many animals currently accepted as conscious. The framework does not seek to refute these theories but to generate testable predictions that can be compared with theirs, advancing the debate through empirical competition.

5.6 Inter-Attractor Conflict: An Open Problem for the Federation Model

A federation of semi-autonomous attractors inevitably generates conflict. Everyday clinical phenomena illustrate this: nausea during a cognitively demanding task (ENS and cortical attractors in tension), cardiac arrhythmia during emotional stress (ICNS and limbic system in conflict), hypoglycemic cognitive impairment (pancreatic and cortical attractors in opposition). The current paper does not propose a mechanism for conflict resolution beyond the brain's general regulatory role. Whether such conflicts are resolved by hierarchical dominance, temporal multiplexing, or some form of inter-attractor negotiation is an open question. We flag it as a priority for future theoretical development within the framework.

6. The Alien Feeling and Clinical Dissociation

When coupling between the global self and a local attractor falters, the experience can manifest as an “alien feeling”—the sense that an action or bodily state is “not mine.” This phenomenon is well-documented in alien hand syndrome (Della Sala et al., 1991) and in depersonalization disorder, where individuals report feeling detached from their own body and

mental processes (Sierra & David, 2011). We interpret these as temporary or chronic decoupling of a local attractor from the global workspace—exactly what the federation model would predict when integration fails.

7. Testable Predictions

The framework generates five falsifiable predictions:

1. **ENS conditioning:** An isolated intestinal segment, exposed to a neutral stimulus paired with a non-nociceptive chemical infusion, will exhibit a conditioned motor or hormonal response.
 2. **ICNS plasticity:** Long-term heart rate variability biofeedback will produce persistent changes in baseline cardiac rhythms not fully mediated cortically.
 3. **Gut-directed therapy:** IBS patients receiving gut-directed biofeedback will show greater symptom improvement than those receiving standard CBT alone.
 4. **Pancreatic memory:** In a vagally denervated preparation, islet cell clusters exposed to repeated glucose perturbation will exhibit an anticipatory insulin response.
 5. **Spinal reorganization:** Complete spinal cord injury patients will develop complex, coordinated responses below the lesion beyond simple reflexes, consistent with a reorganizing local attractor.
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8. Future Directions: Approaching the

Phenomenal Gap

The framework operates on behavioural and functional proxies for consciousness; it does not provide direct phenomenological access to organ-level experience. What evidence could begin to bridge this gap? We propose three directions. First, decoupling experiments that temporarily isolate a candidate organ (e.g., via selective pharmacologic blockade) and then probe the subject's subjective state could reveal whether the organ's local attractor contributes a distinct experiential component to the global self. Second, longitudinal studies of spinal cord injury patients who report phantom sensations or "body memories" below the lesion may provide indirect reportable correlates of spinal attractor activity. Third, the development of organ-specific interoceptive training protocols, coupled with experience-sampling methods, could track whether changes in organ function co-vary with changes in the felt sense of self. These are early-stage proposals; the phenomenal gap remains the deepest challenge for the framework, as for all theories of consciousness.

9. Clinical Implications

If organs are candidate conscious systems, functional disorders may represent distressed local attractors. IBS may be a gut that has learned to react to benign stimuli as threats. Cardiac anxiety may reflect a perturbed ICNS state. These reframings suggest organ-directed therapies: gut-directed biofeedback, vagal stimulation, dietary protocols that calm the ENS. The principle is consistent with existing mind-body approaches but grounds them in a specific, testable model.

10. Ethical Considerations

Candidate organs are not autonomous moral agents. Their interests are tied to the whole body's survival. Clinical ethics correctly prioritize the patient's overall well-being. The framework suggests a principle of organ-level respect: where possible, preserve organ integrity and explore gentler interventions before resection or ablation. This is holistic medicine, not radical ethics.

11. Conclusion

The brain is not the body's sole candidate conscious organ. The ENS, ICNS, pancreatic network, and spinal cord meet the same functional criteria used to identify *C. elegans* as a candidate for minimal consciousness. They are not established as conscious; they are identified as systems for which the question cannot be dismissed a priori without a principled exclusion criterion. The coupling mechanisms that bind local attractors into a unified self are partially characterized, and the framework generates concrete, falsifiable predictions. The conscious body is a research-generative hypothesis, not a completed theory.

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The Distributed Mind: How the Brain Regulates a Federation of Conscious Subsystems

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Based on: Extended collaborative development of the attractor framework, N=1 physiological experimentation, and a re-reading of Spinoza's conatus.

Abstract

Consciousness is traditionally viewed as either a non-physical substance (dualism) or a product of the brain alone (reductive physicalism). This paper presents an alternative: the human

body is a nested hierarchy of semi-autonomous, attractor-based conscious subsystems—each with its own rudimentary integration, valence, learning, and goal-directedness. Using the nematode *C. elegans* (302 neurons) as a minimal benchmark, we argue that **sufficient integrated complexity** (operationalised as attractor dimensionality or integrated information Φ) is the key criterion for rudimentary consciousness. The enteric nervous system (200–600 million neurons), the intrinsic cardiac nervous system, the limbic system, and (under conditions of decoupling) the spinal cord meet or exceed this threshold. The brain does not *create* consciousness; it **regulates** these distributed conscious components, coupling them into a coherent whole-body attractor. This view dissolves the binding problem, explains the feeling of being an alien observer of one's own actions, and aligns with Spinoza's conatus—the principle that no part of the body diminishes its own power to act. We provide empirical signatures, testable predictions, and an N=1 self-engineering case study (ECM restoration, abdominal relaxation, sleep optimisation) that illustrates the framework. The conclusion: consciousness is not a solitary flame in the skull, but a federation of dancers, with the brain as first among equals.

1. Introduction

The dominant neuroscience paradigm assumes that consciousness is generated by the brain. Yet this assumption struggles to explain:

- Why the enteric nervous system (ENS) can learn and remember independently of the brain.
- Why cardiac signals influence decision-making and self-awareness.

- Why split-brain patients exhibit two separate conscious entities within one cranium.
- Why the universal feeling of “not being in control” (“*why did I do that?*”) persists.

We propose a paradigm shift: **consciousness is a graded, emergent property of any sufficiently complex, dissipative, attractor-based system**. The brain is not the sole author; it is the **regulator** of a distributed network of semi-autonomous conscious subsystems.

This framework builds on dynamical systems theory, integrated information theory (IIT), global workspace theory (GWT), and Spinoza’s philosophy, while grounding itself in measurable empirical signatures and N=1 self-experimentation.

2. The Attractor Framework for Consciousness

2.1 Core Definitions

- **Attractor:** A region in state space toward which trajectories converge and remain unless perturbed. Characterised by negative Lyapunov exponents and basin stability.
- **Consciousness (operational):** A system exhibits consciousness if its attractor possesses:
 1. **Integration** – binds multiple sensory/interoceptive streams.
 2. **Self-reference** (minimal) – distinguishes self from environment.
 3. **Valence** – attraction to some states, repulsion from others.

4. **Learning** – attractor landscape changes with experience.
5. **Goal-directedness** – acts to maintain its basin (conatus).
6. **Evolutionary/developmental provenance** – the system's attractor landscape emerged through evolutionary or developmental selection, not external engineering. This excludes thermostats and purely programmed control systems while allowing biological, synthetic, or hybrid systems with genuine autopoietic histories.

- **Mind:** A conscious attractor. Not a substance, but a real, causally effective pattern (like a whirlpool).

2.2 The Minimal Benchmark: *C. elegans*

The nematode *C. elegans* has exactly 302 neurons. Despite this simplicity, it exhibits:

- Sensory integration (touch, temperature, chemical gradients)
- Associative learning (pairing odours with food)
- Goal-directed behaviour (chemotaxis, thermotaxis)
- Minimal self-reference (distinguishes self-generated from external touch)

Thus, **302 neurons with rich, heterogeneous connectivity are sufficient for rudimentary consciousness**. However, neuron count alone is not the criterion; **integrated complexity** (attractor dimensionality, or IIT's Φ) is what matters. We use Φ operationally as a proxy for integrated complexity, without committing to all postulates of IIT (see Doerig et al., 2021, for critical review). *C. elegans* has high integrated complexity relative to its neuron count. A subsystem with many neurons but low connectivity or heavy

enslaving may not reach the same threshold.

3. The Federation of Conscious Subsystems in the Human Body

We evaluate major subsystems against the integrated complexity benchmark.

Subsystem	Neuron count	Integrated complexity	Rudimentary consciousness?	Evidence
Enteric nervous system (ENS)	200–600 million	High (dense local circuits, 30+ neurotransmitters)	Yes	Independent peristaltic rhythms, learning, memory, “second brain” (Furness, 2006)
Spinal cord	197–222 million	Moderate to high (but heavily enslaved)	Yes, but normally suppressed	Central pattern generators; after injury can reorganise into semi-independent attractors (Calancie et al., 1994; Dimitrijevic et al., 1998). Evidence for “spinal consciousness” remains preliminary.
Intrinsic cardiac nervous system (ICNS)	14,000–43,000	Moderate (local processing loops)	Intermediate (contributor)	Influences emotion, decision, interoception (McCraty et al., 2009)

Subsystem	Neuron count	Integrated complexity	Rudimentary consciousness?	Evidence
Limbic system	tens of millions	High (emotional valence, memory)	Yes	Often acts before cortical awareness; strong valence and learning
Basal ganglia & motor routines	>100 million	Moderate (procedural)	Yes (habitual)	Automatic action sequences, operate semi-autonomously
Immune system	N/A (non-neural)	Low (no centralised attractor)	Proto-conscious	Learns, remembers, communicates; lacks integration into a unified attractor
Gut microbiota	N/A (trillions of microbes)	N/A (external ecosystem)	No	Perturbs human attractors but has no intrinsic nervous integration

3.1 The ENS: A Second Conscious Mind?

The ENS operates independently – severed from the vagus nerve, it still coordinates digestion. It uses over 30 neurotransmitters, including 95% of the body’s serotonin. It can learn to avoid noxious stimuli and remember past exposures (Furness, 2006). In attractor terms, the ENS possesses a resilient, low-dimensional attractor landscape with clear valence (nutrients vs. toxins) and goal-directedness (propulsion, secretion). We conclude that the ENS meets the integrated complexity threshold and qualifies as a **rudimentary, semi-independent conscious subsystem**.

3.2 The Heart’s “Little Brain”

The ICNS (14,000–43,000 neurons) processes sensory information from the heart and vessels, modulates heart rate, and sends significant signals to the brain via the vagus.

Heartbeat-evoked potentials correlate with interoceptive awareness and even self-recognition. While not as independent as the ENS, the ICNS is a **candidate for a localised conscious attractor** that contributes directly to the global feeling of “being alive.”

3.3 The Enslaved Majority: Spinal Cord

The spinal cord's 200 million neurons far exceed the *C. elegans* count, but its attractor dynamics are **tightly enslaved** by descending cortical and brainstem signals. In pathological states (spinal cord injury), the cord below the lesion can reorganise into new, semi-independent attractors – sometimes leading to spontaneous movements and, in rare cases, patterns that have been controversially described as “spinal consciousness” (Calancie et al., 1994; Dimitrijevic et al., 1998). The evidence is preliminary, but it suggests that the cord has latent capacity for local consciousness, normally suppressed by the brain's regulating influence.

4. The Brain as Regulator, Not Sole Generator

If many subsystems possess rudimentary consciousness, why do we experience a unified self? Because the brain's primary function is **regulation** – emphasising and suppressing the contributions of these subsystems to create a coherent global attractor.

4.1 Spinoza's Conatus: No Part Diminishes Its Own Power

Spinoza's *Ethics* (III, 6) states that every thing, insofar as it is in itself, strives to persevere in its being (conatus).

A part of the body, left alone, does not curb its own power to act. Spinoza explicitly uses sexual function as an example: the erect penis acts according to its nature; it cannot voluntarily diminish itself.

Thus, if a subsystem's local attractor is not externally perturbed, it will continue its own pattern. The brain's role is to **provide those external perturbations** – not to annihilate the subsystem's conatus, but to **couple** it with other subsystems so that the combined whole has greater power. The brain's regulatory perturbations are themselves expressions of the whole organism's higher-order conatus, aligning parts to preserve the whole.

4.2 Regulation by Emphasis and Suppression

The brain does not “command”; it modulates. Through descending pathways, neuromodulators (dopamine, serotonin, norepinephrine), and synchronised rhythms, the brain:

- **Amplifies** certain subsystem signals (e.g., gut hunger signals become conscious cravings).
- **Damps** others (e.g., spinal reflexes are suppressed during voluntary movement).
- **Entrains** rhythms (e.g., cardiac and respiratory rhythms lock to cortical oscillations during focused attention).

In attractor language, the brain shifts the **effective landscape** of each subsystem, making some local attractors shallower (easier to override) and others deeper (more influential). This is regulation, not annihilation.

4.3 The Alien Feeling: When Regulation

Falters

When you ask “*why did I do that?*” – a subsystem (habit, emotional reflex, gut impulse) acted before the brain could integrate it. The global attractor was temporarily misaligned. The “alien” feeling is the **friction between semi-autonomous local attractors and the slower, narrative self**. It is not pathology; it is the normal noise of a distributed system. Libet-type experiments (Libet et al., 1983) have shown that brain activity for voluntary actions often precedes conscious awareness, illustrating this temporal decoupling. (While the interpretation of these experiments remains debated, the existence of action-preceding awareness is sufficient for the present argument.)

5. Empirical Signatures and Testable Predictions

5.1 Signatures of Subsystem Consciousness

- **Local learning and memory** (e.g., ENS conditioned aversion; Furness, 2006).
- **Semi-autonomous rhythms** (e.g., slow waves of the gut, heartbeat variability).
- **Local valence** (e.g., immune cells produce pro- vs anti-inflammatory attractors).
- **Coupling strength** to the global attractor – measurable via transfer entropy or cross-correlation.
- **Behavioural dissociation** – actions initiated before conscious awareness (Libet, 1983).

5.2 Predictions

1. **Perturbation of a subsystem (e.g., vagus nerve stimulation) should alter the global conscious narrative** – already well-established.
 2. **Decoupling a subsystem (e.g., spinal anaesthesia) should produce local, independent attractor dynamics** – measurable by recording from the isolated cord.
 3. **Training a subsystem (e.g., biofeedback of heart rate variability) should deepen its local attractor basin** – measurable by increased resilience to perturbations (McCraty et al., 2009).
 4. **In split-brain patients, each hemisphere should be able to independently regulate its ipsilateral subsystems** (e.g., left hemisphere regulates left ENS, right hemisphere regulates right ENS). A suitable protocol would present lateralised interoceptive cues (e.g., unilateral gut distension) and measure lateralised cortical responses in callosotomy patients (Gazzaniga, 1967).
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6. N=1 Case Study: Restoring Whole-Body Coherence

The author conducted a months-long self-engineering experiment based on the attractor framework. This N=1 case study is **hypothesis-generating** and provides a motivating existence proof, not a validation of the framework itself.

6.1 Interventions

- **ECM restoration:** Gelatin, taurine, 28 Hz vibration plate

(90 min every other day), contrast baths. Improved collagen accretion, VO_2 max, skin quality.

- **Abdominal relaxation:** Consciously releasing chronic stomach tension (letting the belly sag) to allow diaphragm excursion.
- **Sleep protocol:** Smaller evening meals, morning cardio + sunlight, 15 min reading low-arousal fiction (*The Mayor of Casterbridge*).

6.2 Outcomes

- Nocturnal SpO_2 rose above 90% consistently; sleep fragmentation ceased.
- Deep sleep reached acceptable levels.
- Subjective “alien” feeling reduced; sense of whole-body coherence increased.

6.3 Interpretation

Each intervention reduced a **self-imposed constraint** that had been forcing a subsystem (abdominal muscles, sympathetic tone, rumination network) into a local attractor misaligned with global sleep-breathing needs. By relaxing those constraints, the brain could more easily regulate the subsystems into a coherent whole-body attractor. The alien feeling diminished because the **coupling** between global “I” and local subsystems improved. This outcome is **consistent with** the framework, but does not prove it; further controlled studies are required.

7. Philosophical Implications

7.1 Spinoza Vindicated

Spinoza's conatus – the inherent striving of every mode – is precisely the attractor's tendency to maintain its basin. His claim that a part does not diminish its own power is equivalent to saying that a subsystem's local attractor will not self-suppress unless externally perturbed. The brain provides those perturbations, not to diminish but to **align**. Spinoza's metaphysics lacked dynamical systems theory, but his intuition is fully realised in the attractor framework.

7.2 The Binding Problem Dissolved

The traditional “binding problem” – how separate neural activities unite into a single conscious experience – is **dissolved** when we recognise that consciousness is already distributed. The global attractor *is* the binding. No extra mechanism is required; coupling *creates* coherence. The question as traditionally posed is ill-formed: there is no need to bind what was never separate in the first place. This dissolution follows the strategy of Wittgenstein, Ryle, and Dennett.

7.3 The Self as Negotiation

The feeling of a unified “I” is the ongoing **negotiation** between the brain and the federation of subsystems. When negotiation runs smoothly, you feel at home in your body. When it stutters, you feel like an alien. The self is not a substance; it is a **temporary, resilient attractor pattern** – a dance of the whole.

8. Conclusion

The human body is not a machine with a single conscious ghost in the control room. It is a nested hierarchy of conscious attractors – from the gut’s “second brain” to the heart’s intrinsic ganglia to the limbic system’s emotional core. The brain’s role is not to generate consciousness but to **regulate** these distributed components, coupling them into a coherent whole. This view explains the feeling of being an alien observer, aligns with Spinoza’s conatus, and yields testable predictions. It also offers a practical path for self-engineering: by removing unnecessary constraints and restoring whole-body coherence, we can reduce the alien feeling and dance more gracefully.

The mind is not a solitary flame. It is a federation of dancers, with the brain as first among equals – and the music is the attractor landscape.

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The Attractor Framework: A Tool for Seeing Clearly

(Or: Why You're Probably Pressing a Lever Right Now)

Not a comforting story. A diagnostic tool. And if you're lucky, a lifeline.

Most philosophies are judged by how beautiful they sound. The attractor framework is judged by whether it works. If it cannot explain why a cat is easier to reason with than a zealot, why a dying animal hums, or why nations march toward a war they all claim to dread – then it is worthless. Burn it.

This essay introduces the framework by applying it to the world as it actually is. Not as you wish it were. Not as your priest or politician tells you it is. As it is.

The Lever That Kills

In 1954, two scientists named Olds and Milner implanted electrodes in rats' brains. When a rat pressed a lever, it received a small jolt to its pleasure center. The rats pressed that lever *thousands of times per hour*. They ignored food. They ignored water. They ignored their own young. They died with their paws on the lever.

The brain does not have a truth detector. It has a reward system.

Every human behavior that looks exactly like a rat on a lever

– the doomscrolling, the rage-posting, the righteous certainty that feels like moral clarity – is driven by the same loop. Dopamine fires. The behavior reinforces. The loop tightens. The fire feels good.

I call these loops **fantasy attractors**. They are belief systems with *low corrective permeability*. They resist new evidence. They reframe contradiction. They attack the source. They seal themselves shut.

The rat never knew why it was dying. Neither do you.

Two Kinds of Belief

Every persistent belief system is an attractor. The key variable is **corrective permeability** – how easily the system updates when reality punches it in the face.

- **High-permeability attractors** are reality-aligned. Science (when it works). Functional relationships. A well-maintained body. They absorb feedback, adjust, and deepen. Their error half-life is short. They can learn.
- **Low-permeability attractors** are **fantasy attractors**. They resist correction. They reframe contradictory evidence. They attack the source. They seal themselves. Their error half-life is *infinite*, because the error is never allowed to land.

You can see this in a marriage. A couple with high permeability argues, adjusts, and grows. A couple with low permeability recycles the same fight for thirty years. One is dancing. The other is pressing a lever – and calling it love.

The Eternal Skeleton (And Why You Will Die)

Beneath all the transient drama, something else is humming.

Some things never decay. The electron. The proton. Three types of neutrinos. No known decay. They don't need energy. They don't age. They are the **eternal skeleton**. Their fixed frequencies are the universe's metronomes. They define time without a clock.

On that skeleton, **dissipative attractors** dance. A flame. A body. A society. A mind. These require continuous energy. They are born, they persist for a while, and they run down. **You are a dissipative attractor.**

The eternal skeleton does not think. It does not care. It just hums. Everything you love – every memory, every hope, every person – is a temporary dance on that floor.

That is not pessimism. That is clarity.

The Mind Is Not in Your Head

The mind is not a ghost in the machine. It is not a computer made of neurons. **The mind is the emergent attractor of the entire body** – the phase-locked coherence of an organism navigating a world of constraints.

That is why restoring your body's physical scaffolding (the extracellular matrix) deepens your mental stability. Body and mind are one attractor. Consciousness is not a substance. It is a dynamical state. Change the body, change the mind. There

is no escape hatch.

The Real World: From the Rat to the Middle East

Religion as Lever-Pressing

The “doctrine of double effect” created a lethal calculus: saving an eternal soul is infinite gain; killing a heretic is a finite evil (the heretic was going to hell anyway). Infinite minus finite equals infinite gain. **Mathematically, murder becomes a moral obligation.** This is a sealed, low-permeability attractor.

The 1933 Concordat between the Vatican and Hitler was the same calculus in diplomatic form. The Church protected baptized Jews – those in the infinite gain column. The unbaptized were left outside. The silence was permission. A fantasy attractor, coupled to political power, abandons shared reality with a formula.

That is not an argument about religion. It is a **dynamical diagnosis.**

The Meta-Attractor Converging Now

Three Abrahamic attractors – Judaism, Christianity, Islam – each carry a deep apocalyptic basin. For centuries, these basins were separate. **Now they are phase-locking.**

- Christian Zionism funds Israel because Israel is a prerequisite for the Rapture.
- Shia eschatology frames Iran’s moves as the Mahdi’s rise.

- Jewish messianism retrofits October 7 as the birth pangs of redemption.

Each group presses its dopamine lever. Each lever press perturbs the others, deepening their own apocalyptic expectations. The meta-attractor is now closed. **The Middle East is not a political crisis. It is a dynamical system being pulled toward a single catastrophic basin** – while all parties call their lever “prophecy fulfilled.”

This is not conspiracy. This is **coupling dynamics**.

Political Fantasy Attractors

When reality makes people feel cheated, a fantasy attractor offers a new story. A complex, painful reality is replaced by a simple, dopamine-rich narrative: *“You are the true people. Your loss was a theft. I will restore greatness.”*

Corrective permeability drops to zero. The goal is no longer to win an argument. It is to **dismantle the institutions that could deliver a fatal correction**. That is the signature of a fantasy attractor in its terminal phase.

You have seen this. You know where it leads.

The Antidote: Reality Alignment

The framework does not offer salvation. It does not promise meaning. **It offers a survival strategy:**

- Maintain high corrective permeability.
- Protect your own coherent basin from colonizing attractors.
- Align with the metronomes – the only things that don’t

lie.

The Cat as Teacher

My cat Smoky doesn't use language. He has no internal monologue. He doesn't proselytize. He operates from deep, evolved attractor basins.

When he fails at a human task, I call him dumb. When he executes a pounce I could never replicate, I call him brilliant. The judgment is local and affectionate.

He does not try to colonize my basin. He just lives his.

That mutual respect is the social expression of *Wu Wei* – effortless action, the ancient Taoist recognition that the deepest navigation is non-forcing. Most human conflict comes from our refusal to offer what a cat offers effortlessly: coexistence without colonization.

The cat is not your enemy. The cat is your teacher. The zealot is the rat on the lever.

The Body as Attractor

I spent a year running an $N=1$ experiment to restore my extracellular matrix. Ninety minutes every other day on a vibration plate at 28 Hz. The result: a 5-point increase in $\dot{V}O_2$ max in two months. Over 400 grams of collagen accretion.

The plate is a rhythmic mechanical perturbation that phase-locks the body's repair systems.

A dying cat purrs at the same frequencies that stimulate collagen synthesis. The cat hums itself toward healing. I externalized the purr. The body does not need an internal narrator to heal. It needs the right perturbation.

Your body knows what to do. You just keep getting in the way.

Happiness Is Not a Quick Thrill

The culture defines happiness as a dopamine hit – acquisition, validation, the lever press. **That is not happiness. That is addiction.**

The attractor framework defines happiness as *confidence in the present and future*. It is a deep, stable basin with high corrective permeability and robust recovery. Despondency is a shallow basin, constantly buffeted.

Happiness is not a feeling you chase. **It is the byproduct of a well-maintained attractor aligned with reality.**

You don't chase the fire. You build the hearth.

How to Stay Reality-Coupled: A Daily Practice

You don't need to master the framework. You just need **one daily question**:

Did I update any belief yesterday?

If the answer is no for a week, **you are in a fantasy attractor**. The lever has your paw.

Start small. One less dopamine hit. One minute of morning light. One honest conversation with someone whose basin you trust. Restore the body. Hum.

You will feel the difference before you understand it.

What the Framework Explains

The attractor framework earns its keep by making sense of things other frameworks obscure:

- Why a cat is easier to coexist with than a human sealed in a fantasy attractor.
 - Why a dying mammal hums at the frequency that repairs collagen.
 - Why a theological calculus can justify genocide without a twinge of discomfort.
 - Why nations march toward a war that each side believes is divinely ordained.
 - Why a political movement will break institutions rather than update its beliefs.
 - Why restoring the body's physical matrix deepens the mind's coherence.
 - Why releasing control in a lucid dream – *Wu Wei* – is the deepest form of navigation.
-

No Salvation. Just Alignment.

The metronomes will still hum when the last human fantasy attractor has collapsed. They do not decay. They never did. They never will.

The eternal skeleton is unconscious and uncaring. But for the brief, finite dance of a dissipative attractor, **alignment with that skeleton is the only ground that does not kill you.**

The lever is hot. The fire feels good.

The only reliable alternative is reality.

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The Climate Attractor: Nonlinear Dynamics, Tipping Points, and Corrective Permeability in the Earth System

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Abstract

The Earth's climate is a dissipative attractor—a far-from-equilibrium system maintained by a continuous flow of solar energy and entropy export. For 10,000 years, the Holocene basin remained stable due to a network of negative

feedbacks that conferred high corrective permeability on the climate system. Since the Industrial Revolution, a sustained, rapid perturbation in atmospheric greenhouse gas concentrations has saturated several of those feedbacks and begun activating positive feedback loops that push the system toward basin transitions. This paper applies the attractor framework to the climate crisis, arguing that linear assumptions about gradual, reversible warming constitute a fantasy attractor, and that tipping points are best understood as ridges between alternative attractor basins. The framework also diagnoses three common social attractors—denial, doom, and techno-utopianism—as low corrective permeability belief systems that reduce the urgency to act. The paper concludes that the principle of corrective permeability (κ) must be institutionalized in climate policy and individual cognition alike, and that physical systems update whether human belief systems do or not.

1. Introduction: The Earth as a Dissipative Attractor

The Earth is not a closed system in thermodynamic equilibrium. It is an open, dissipative system maintained far from equilibrium by a continuous influx of solar radiation and the radiative export of entropy to space. Its climate—the long-term statistical pattern of temperature, precipitation, wind, and ocean circulation—is an emergent attractor: a persistent, self-regulating dynamical state.

For approximately 10,000 years, the Earth's climate has occupied a relatively narrow basin known as the Holocene. Within this basin, human civilization emerged and developed agriculture, cities, trade networks, and complex societies. The basin's apparent permanence encouraged a cognitive error

that now carries severe consequences: we mistook the walls of the basin for the horizon.

The attractor framework (Galida, 2026) defines reality operationally as *persistence under perturbation*. A stable attractor absorbs perturbations and returns to its basin; an unstable one, when pushed beyond a critical threshold, undergoes a phase transition into a different basin with different structural properties. This paper applies that framework to the climate system, with three objectives:

1. To characterize the Holocene basin's stabilizing feedbacks and the perturbation now overwhelming them.
2. To reframe climate tipping points as ridges between alternative attractor basins, emphasizing the role of perturbation rate relative to system recovery time.
3. To diagnose the social dynamics of the climate debate using the same principle of corrective permeability (κ) that describes the physical system.

2. The Holocene Basin: Stabilizing Feedbacks and Corrective Permeability

A stable attractor basin does not persist by accident. It persists because negative feedback loops counteract perturbations, pulling the system back toward equilibrium. The Holocene's stability was maintained by a network of such loops.

Ocean heat absorption. The ocean's thermal inertia acts as a buffer: when atmospheric temperatures rise, the ocean absorbs excess heat, slowing surface warming. This negative feedback

dampens short-term fluctuations.

Ice-albedo feedback (negative phase). Polar ice sheets reflect incoming solar radiation back to space. When the climate cooled slightly, ice expanded, increasing albedo and reinforcing cooling. When it warmed, the feedback operated in reverse, but on timescales slow enough to avoid runaway warming.

Forest transpiration. Large forest systems, particularly the Amazon and Congo basins, generate their own rainfall through evapotranspiration. This self-sustaining moisture cycle stabilizes regional climates and prevents desertification.

Silicate weathering thermostat. Atmospheric CO₂ dissolves in rainwater, forming carbonic acid that weathers silicate rocks. The dissolved carbon is transported by rivers to the ocean, where it precipitates as carbonate minerals and is eventually subducted. This negative feedback operates on timescales of hundreds of thousands of years, but it has regulated atmospheric CO₂ across geological epochs.

These feedbacks collectively conferred high *corrective permeability* (κ) on the Holocene climate. When perturbed—by volcanic eruptions, solar variability, or orbital cycles—the system responded with countervailing adjustments. The basin absorbed the perturbation and returned to its attractor. The basin was deep.

3. The Perturbation: Magnitude, Rate, and the Saturation of Corrective Capacity

Since the Industrial Revolution, the human enterprise has

introduced a sustained, massive perturbation into the climate system through the combustion of fossil fuels, industrial agriculture, and land-use change. Atmospheric CO₂ concentration has risen from approximately 280 parts per million (ppm) to over 420 ppm—a level not seen since the Pliocene, roughly 3 million years ago. Methane and nitrous oxide concentrations have risen sharply as well.

The attractor framework requires that a perturbation be assessed on two dimensions: magnitude and rate. A slow perturbation, even a large one, allows an attractor's corrective mechanisms time to operate. A fast perturbation—one delivered on a timescale shorter than the system's characteristic recovery time—can overwhelm those mechanisms and force a basin exit regardless of absolute magnitude.

The current perturbation is fast by geological standards. The rate of CO₂ increase during the Paleocene-Eocene Thermal Maximum (PETM), a natural warming event approximately 56 million years ago associated with mass extinction, was roughly 0.025 GtC per year. The current rate is estimated at approximately 10 GtC per year—around 400 times faster. The ocean's capacity to absorb heat is approaching saturation. The silicate weathering thermostat operates on timescales two to three orders of magnitude longer than the human perturbation. The system's corrective permeability is being saturated.

The key intellectual error in much public climate discourse is *linear thinking*: the assumption that gradual emissions increases produce gradual, proportional, and reversible temperature increases. This assumption is itself a fantasy attractor. The climate system is nonlinear. It contains tipping points—critical thresholds beyond which the system undergoes a phase transition into a new attractor basin. Once crossed, these transitions are not easily reversed. The perturbation is not merely large. It is arriving at a speed that the system's corrective mechanisms cannot match.

4. Tipping Points as Ridges Between Basins

A tipping point, in attractor terminology, is a ridge between basins. Below the ridge, the negative feedbacks that define the current basin remain dominant. At the ridge, they are precisely balanced by positive feedbacks. Beyond the ridge, positive feedbacks dominate, and the system cascades into a new basin. The transition is not a smooth slope. It is a phase change.

The following tipping elements are currently under scientific investigation. In each case, the attractor framework identifies the competing feedbacks and the ridge structure. Where scientific uncertainty exists, it is stated explicitly.

4.1 The Greenland Ice Sheet

The Greenland Ice Sheet is stabilized by its own elevation: the surface is high enough to remain cold, and snowfall replenishes mass. As melt accelerates, the surface elevation decreases, exposing the ice to warmer air—a positive feedback. Current research suggests that Greenland may have a critical threshold between approximately 0.8°C and 3°C of warming above pre-industrial levels, with a central estimate near 1.5°C. However, crossing this threshold does not imply imminent, catastrophic collapse on human political timescales. Full loss of the ice sheet would likely unfold over centuries to millennia, though the process may become irreversible once the threshold is crossed. Sea level rise of up to seven meters is the ultimate consequence, but the timescale is millennial. The ridge is uncertain in both position and temporal gradient.

4.2 The Atlantic Meridional Overturning Circulation (AMOC)

The AMOC is a major ocean current system driven by temperature and salinity gradients. It has at least two stable attractor basins: a strong circulation mode (the current state) and a collapsed or substantially weakened mode. Freshwater input from melting Greenland ice reduces surface water density, weakening the sinking motion that drives the circulation. Multiple climate models show a weakening trend under continued warming, but the proximity to a critical threshold remains debated. Observational evidence indicates that the AMOC is currently at its weakest in over a thousand years (Caesar et al., 2021). Some research suggests a collapse could occur within decades once triggered; other models find the circulation more resilient. The scientific community has not reached consensus on the threshold's location or the likelihood of near-term crossing. The ridge exists; its distance and height are incompletely characterized.

4.3 The Amazon Rainforest

The Amazon generates a substantial fraction of its own rainfall through evapotranspiration. This is a stabilizing feedback that maintains the forest basin. Deforestation and regional drying weaken this feedback. Beyond a critical level of tree loss (estimated by some studies at 20–25% of original cover), the moisture cycle may break down, triggering a transition to a savanna state. This would release stored carbon and permanently alter regional and global climate. Quantitative modeling suggests that tropical forests exhibit hysteresis, meaning that once a critical threshold is crossed, returning to the original forest state requires a much larger reversal of conditions (Staal et al., 2020). However, the precise threshold remains uncertain, and the interaction of deforestation with global warming complicates prediction. The ridge is plausible but not precisely located.

4.4 Permafrost Carbon Feedback

Northern permafrost soils contain approximately 1,400–1,600 GtC—roughly twice the carbon currently in the atmosphere. As permafrost thaws, microbial decomposition releases CO₂ and methane. This is a positive feedback: warming drives thaw, thaw releases greenhouse gases, which drive further warming. The process is already underway. However, the rate of release is heavily dependent on future emissions trajectories. Lower emissions scenarios substantially reduce the total carbon release over the coming centuries. Permafrost carbon feedback is not a binary, unstoppable runaway process; it is a continuous, trajectory-dependent amplifier of warming. The strength of the amplification is a function of the perturbation magnitude.

4.5 Coupling and Cascade Risk

The individual tipping elements described above do not operate in isolation. They are coupled basins. A perturbation that pushes one across its ridge can propagate through the network, pushing others in turn. This cascade logic is what distinguishes the attractor framework from a list of separate tipping points. The framework's central physical insight is that the climate system's basins are interconnected, and a transition in one alters the boundary conditions—and thus the ridge positions—of its neighbors.

The coupling sequence is structurally clear. Greenland melt injects freshwater into the North Atlantic, reducing surface density and weakening the AMOC. A weakened AMOC shifts tropical rainfall belts southward, drying the Amazon and increasing fire risk. Amazon dieback releases stored carbon into the atmosphere. Permafrost thaw, accelerated by the same warming, releases additional carbon. Each basin exit amplifies the perturbation driving the next. The climate's corrective permeability, once maintained by a web of negative feedbacks,

is being progressively replaced by a network of positive couplings that amplify the initial perturbation. This does not imply inevitability. It implies nonlinear risk amplification, in which the probability of cascading transitions increases with continued perturbation. The cascade is not a prediction. It is a structural feature of a coupled nonlinear system. Foundational research on tipping elements first systematically catalogued these components and their interactions over a decade ago (Lenton et al., 2008); subsequent observational and modeling work has strengthened the case that the coupling is real.

5. Social Attractors: Denial, Doom, and Techno-Utopia

The public debate surrounding climate change is itself a dynamical system of competing attractor basins. Three common configurations exhibit low corrective permeability (κ). In each case, the diagnosis applies not to the *content* of the belief but to its *impermeability to disconfirming evidence*. A high- κ individual may hold any of the positions described below, provided that position is genuinely falsifiable and updated when evidence shifts.

5.1 The Denial Attractor

The denial attractor reframes evidence of anthropogenic warming as natural variability, scientific fraud, or politically motivated exaggeration. Disconfirming data—temperature records, ice core analyses, model projections—are dismissed or attributed to conspiratorial motives. The dopamine reward is social: the denier occupies the role of truth-teller bravely resisting a corrupt consensus. The self-reinforcing loop is tribal belonging: each

act of dismissal earns approval from the in-group, deepening the basin. Corrective permeability is near zero.

5.2 The Doom Attractor

The doom attractor asserts that tipping points have already been crossed, that warming is now unstoppable, and that all mitigation efforts are futile. This position is often defended with scientific references, but it shares with denial a structural consequence: the rationalization of inaction. If nothing can be done, nothing need be done. The dopamine reward is moral certainty: despair presents itself as clarity, and the doomer feels superior to the “naive optimist.” The self-reinforcing loop operates through despair validating itself by dismissing hope as naivete. Any evidence of progress—falling renewable costs, policy victories, accelerating deployment—is reframed as “too little, too late.” The basin deepens with each dismissed success.

5.3 The Techno-Utopia Attractor

The techno-utopia attractor defers responsibility to hypothetical future technologies—direct air capture, solar radiation management, fusion energy—that are not yet deployed at scale. This position permits continued present consumption without behavioral or political change. The lever is marked “future fix.” The technology may eventually contribute to mitigation, but reliance on it as a substitute for current emissions reductions is a bet on a lever that has not been wired. The self-reinforcing loop operates through continued consumption: each emission-intensive purchase validates the belief that consumption need not change, because a future technology will compensate. The basin deepens with every unreduced carbon footprint.

These three attractors share a functional outcome: they reduce the perceived urgency of emissions reductions. They are not symmetrical in their relationship to evidence—the denial

attractor is the furthest from scientific consensus—but they are symmetrical in their dynamical effect. They are low- κ basins that resist updating.

6. The Physical–Social Symmetry

There is a structural identity between the climate system's dynamics and the social dynamics of the climate debate. Both are instances of the same phenomenon: a system whose corrective permeability is being eroded by positive feedbacks that amplify perturbation rather than dampening it.

In the physical climate, the Holocene's negative feedbacks—ocean heat absorption, ice albedo, forest transpiration, silicate weathering—conferred high κ . Those feedbacks are now saturating or reversing. Ice melt reduces albedo, accelerating warming. Forest loss breaks the transpiration cycle, accelerating drying. Permafrost thaw releases carbon, accelerating the perturbation. The system's negative feedbacks are becoming positive ones. The climate is becoming a sealed basin, driven by internal amplification rather than external correction.

In the social climate, the same transition is underway. High- κ cognition—the willingness to update beliefs when evidence shifts—is being replaced by low- κ basins that reinforce themselves through tribal belonging, despair-validating narratives, or consumption-maintaining deferral. These social attractors function as positive feedbacks on the physical perturbation: denial blocks mitigation policy, doom dismisses it as futile, techno-utopia delays it indefinitely. The social system, like the physical one, is developing sealed basins that amplify the perturbation rather than correcting it.

The symmetry is not metaphorical. It is dynamical. A sealed

belief system and a tipping climate are the same structural phenomenon—a low- k attractor driven by positive feedback—operating at different scales. The climate system and the human systems embedded within it are coupled. The physical perturbation drives social basin-sealing; social basin-sealing accelerates the physical perturbation. Corrective permeability is the variable that determines whether this coupling is damped or amplified. At present, both systems are trending toward amplification.

7. Policy as Institutional Corrective Permeability

The attractor framework yields a specific policy principle: any climate strategy must be designed with explicit update mechanisms, because the system is nonlinear, the models carry irreducible uncertainty, and the ridge positions are incompletely known. The question is not only *what to do* but *how to ensure that the strategy corrects as evidence accumulates*.

High- k climate policy would exhibit the following properties:

- **Adaptive targets.** Emission reduction targets are revised when interim data show deviations from projected pathways. A missed target triggers a stronger response, not a redefinition of the baseline.
- **Technology neutrality with periodic reassessment.** Energy system investments are directed toward the fastest-scaling clean technologies available, with periodic review to incorporate performance data on new options.
- **Feedback-sensitive adaptation.** Adaptation funding (sea walls, drought-resistant agriculture, managed retreat)

is allocated based on observed changes in risk, not static projections.

- **Institutionalized error correction.** Policymaking bodies include formal processes for reviewing failed interventions and updating strategy. Truth-telling is built into governance.

Low- κ policy, in contrast, attaches itself to a fixed target, a favored technology, or a politically convenient narrative. When reality diverges, the institution attacks the messenger, rebaselines the accounting, or reframes failure as partial success. The error signal is never allowed to land. The institution becomes a sealed basin, pressing the lever of its own stated commitments while the physical system moves into a new state.

8. Individual Corrective Permeability: A Methodological Note

The attractor framework holds that macro-scale social attractors are composed of individual cognitive basins. The corrective permeability of a society is, in part, a function of the corrective permeability of its members. This paper does not prescribe personal behavior; it notes an operational question that operationalizes the framework's diagnostic at the individual level:

Would I update my climate beliefs if the evidence shifted decisively?

If the honest answer is no, corrective permeability is approaching zero, and the individual basin is sealed. The content of the belief—whether denial, doom, techno-optimism, or mainstream concern—is irrelevant to this diagnostic. The

diagnostic applies to the structure of belief, not its content.

What, then, characterizes high- k individual cognition in practice? The framework suggests several structural features. High- k individuals tend to make small, durable belief adjustments rather than dramatic, identity-threatening reversals; the basin deepens through repeated correction, not emotional intensity. They separate their identity from their beliefs, so that updating a belief does not feel like losing a self. They seek out disconfirming evidence rather than avoiding it, treating error signals as information rather than threats. And they maintain a distinction between what they know and what they merely find plausible, keeping their confidence calibrated to the strength of the evidence. These features are not personality traits. They are practices. They can be cultivated.

9. Conclusion

The Holocene basin, which persisted for 10,000 years through a network of stabilizing negative feedbacks, is now being perturbed at a rate that saturates those feedbacks and activates positive ones. Tipping points are not slopes; they are ridges between basins. The location of those ridges is uncertain, but the dynamics that generate them are structurally well-understood. Uncertainty is not a case for complacency; it is a case for corrective permeability.

The social dynamics of the climate debate—denial, doom, techno-utopianism—are low- k attractors that reduce the urgency of action. They are structurally identical to the physical dynamics they refuse to confront: sealed basins driven by positive feedback. The policy response must be designed with explicit update mechanisms, because the system is nonlinear

and the future is incompletely predictable. The principle of corrective permeability applies at every scale: physical, institutional, and individual.

The atmosphere does not negotiate. The ice sheet does not care about ideology. The ocean current does not read manifestos. Physical systems update whether we do or not.

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Persistence Under Perturbation: The Eternal Skeleton and the Transient Dance

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Persistence Under Perturbation: The Eternal Skeleton and the Transient Dance

Robert Galida – June 2026 (Revised Edition)

Note to readers: This is a revised version of the May 2026 paper. The core insights about the eternal skeleton and transient dance remain, but the treatment of fundamental metronomes has been refined. For the detailed relational account of time, see the companion paper: [Metronome, Memory, and the Threefold Anchor: A Relational Account of Time F.](#)

Abstract

This paper presents a unified framework based on a simple idea: **persistence under disturbance is the basic mark of reality.**

We divide all persistent things into two classes:

- **Non-dissipative (conservative) structures** – eternal, time-symmetric, mindless. They form the **eternal skeleton** (Planck scale, quantum fields, the three fundamental metronomes: electron, neutrino mass eigenstates, and proton).
- **Dissipative attractors** – temporary, time-asymmetric, needing energy flow. They form the **transient dance**

(life, mind, society, consciousness).

All observed minds are dissipative.

Because the universe as a whole is a conservative system (no outside environment), it cannot have consciousness or intentions.

Therefore, under this framework, a theistic God is extremely unlikely.

No supernatural entities are needed.

The framework gives a naturalistic view of persistence, a graded idea of mind, and a way to study how people get trapped in **fantasy attractors** (belief systems that ignore reality).

Scope Conditions

This framework is not a finished mathematical theory. It is a cross-domain way of thinking about persistence under disturbance. The word “attractor” is sometimes a metaphor, sometimes a precise term. The framework looks for similar stability patterns across different scales, not a single equation. It is an invitation to explore, not a closed belief system.

Part I: The Nature of Mind

1. The Core Intuition

Your mind feels real, long-lasting, and not just brain tissue. Dualism can't explain mind-body interaction. Reductive

physicalism ignores the feeling of being you. We propose a third way: **the mind is a stable, resilient, persistent pattern – an attractor – of your whole body.**

2. Key Definitions

Term	What it means	How to measure
Attractor	A region in state space that pulls nearby states toward it and holds them	Lyapunov exponents, basin stability
Resilience	Ability to bounce back after a hit	Recovery time, hysteresis
Basin of attraction	The set of states that eventually fall into the attractor	Larger basin = more resilient
Attractor dimensionality	How complex the attractor is	Correlation dimension; proxy for integrated information (Φ)
Fantasy attractor	A belief system cut off from reality checks	Low contact with corrections; deep basin; slow updating
Shared reality attractor	A belief system open to reality checks	High contact with corrections; shallow basin; fast updating

3. Signs of a Resilient Attractor

- Bounces back quickly after stress
- Low hysteresis (forward and return paths nearly the same)
- Stable rhythms (HRV, circadian, breathing lock together)
- Cross-domain coupling (better sleep → better mood, immunity)

- Graceful decline under growing stress (not sudden collapse)
- Critical slowing down (rising variance and autocorrelation before a big change)

4. The Third Ontological Category

View	What it says	Problem
Dualism	Mind is a non-physical substance	How can it interact with the body?
Reductive physicalism	Mind is just brain activity	It loses the feeling of being you
Attractor framework	Mind is a real, non-substantial pattern (like a whirlpool)	Fully compatible with physics, keeps subjective experience

A whirlpool is real – it depends on water, affects the flow, and isn't just one water molecule. Your mind is like that.

5. Attractor Framework & Consciousness Theories

- **IIT (Integrated Information Theory):** Attractor dimensionality acts like Φ . Awake animals have higher-dimensional attractors than anesthetised ones (Tajima & Kanai, 2017).
- **GWT (Global Workspace Theory):** “Ignition” means settling into a global attractor that spans many brain areas.
- **Testable predictions:** Shallow attractors (unconscious) are easier to disturb; conscious states have deeper basins and higher dimensionality.

6. The Simplest Mind: *C. elegans* (a tiny worm)

The worm has 302 neurons. It shows: integration of senses, minimal self-reference, valence, associative learning, goal-directed behaviour. That's all we need for a minimal mind. Prediction: during learning, its brain should show higher attractor dimensionality than when paralysed.

7. Mind as a Whole-Body Attractor

Your mind is not just in your brain. It includes your body's extracellular matrix (ECM), hormones, immune system, and gut. Alcohol, sleep, and ECM restoration affect the whole body and change your mind. That's why relaxing your belly, getting morning light, or reading a quiet book can improve your sleep and heart rate variability (HRV).

8. Self-Engineering: Reshaping Your Own Attractor

Because your mind is an attractor, you can change it through small, repeated nudges: learning a skill, exposure therapy, forming habits, meditation, physiological hacks (ECM restoration, belly sag, morning cardio). An N=1 experiment (tracking ECM, sleep, HRV) showed that improvements happen in non-linear, threshold-based jumps – exactly as attractor theory predicts.

Part II: The Eternal Skeleton and the Transient Dance

9. Two Fundamental Classes of Persistence

9.1 Non-Dissipative (Conservative) Structures – The Eternal Skeleton

- No energy loss; total energy stays the same (or exchanges only within a closed system)
- Time-reversible at the level of intrinsic persistence (though weak interactions violate CP/T)
- Stable because of conservation laws (charge, baryon number, energy)
- Do not age, do not die (or are effectively eternal on all observable timescales)

The **three fundamental metronomes** (see *Threefold Anchor* paper) are the most conservative layer of the eternal skeleton:

Metronome	Role
Electron	Lightest charged lepton; invariant Compton frequency
Neutrino mass eigenstates (ν_1, ν_2, ν_3 collectively)	Effectively stable; theoretically invariant frequencies
Proton	Lightest baryon; stability from baryon number conservation

These three are continuously recycled through all dissipative systems. They are the invariant substrate.

Other conservative structures include: Planck-scale granular spacetime, quantum fields, stable atoms, and the universe as a whole.

These make up the **eternal skeleton** – mindless, timeless, the foundation.

9.2 Dissipative Attractors – The Transient Dance

- Need constant energy and must dump entropy
- Time-irreversible (arrow of time)
- Stay stable through feedback loops, homeostasis, and energy use
- Finite lifetime – they age, decay, and eventually collapse
- **What binds all dissipative systems** (a bacterium, a brain, a galaxy, a society) is the continuous recycling of the three eternal metronomes. Every dissipative system operates by exchanging electrons, protons, and neutrinos with its environment.

Examples: living cells, metabolic networks, ecosystems, human bodies, conscious minds, societies, economies, fantasy attractors.

These are the **transient dance** – everything that is born, lasts a while, and dies.

10. Why Mind Requires Dissipation

Every known system with integration, self-reference, valence, learning, and goal-directedness is **dissipative**. No non-dissipative mind has ever been seen. So we conclude that, in this framework, the only kind of consciousness we have evidence for is dissipative. This is a best-explanation inference, not an absolute proof.

11. The Universe as a Non-Dissipative System

The universe as a whole has no outside environment. Its total energy is conserved (or at least doesn't exchange with anything else). So it is non-dissipative:

- No metabolism (doesn't eat, breathe, or repair itself)
- No learning (its laws don't change from experience)
- No valence (no likes or dislikes)
- No goal-directedness (it just follows its equations, doesn't aim for a basin)

Therefore, the universe is **not a mind**. Any global attractor (e.g., a de Sitter vacuum state) is a conservative, eternal, mindless pattern.

12. Why a Theistic God Is Extremely Unlikely (Probabilistic)

A theistic God is supposed to be: conscious, intentional, personal, eternal, unchanging, and self-sufficient.

- Consciousness (as far as we know) requires **dissipation**.
- Eternal, unchanging, self-sufficient means **non-dissipative** (conservative).

No known entity can be both dissipative (aging, needing energy) and non-dissipative (eternal, self-sufficient). So, under this framework, a theistic God is extremely implausible. The universe itself is already the only non-dissipative system. Adding a separate non-dissipative God is unnecessary and, by definition, cannot interact with anything.

13. The Map of Existence

TRANSIENT DANCE (Dissipative Attractors)

- Societies
- Minds
- Cells
- Ecosystems
- Human Body (ECM, HRV)
- Animal Life
- Metabolism (energy + entropy)

↓ (emergence)
ETERNAL SKELETON (Conservative Persistence Structures)
- Atoms
- Three metronomes: electron, neutrino mass eigenstates, proton
- Quantum Fields
- Planck Scale (granular spacetime) ← FLOOR

Legend: Floor = Planck-scale granularity – the hard, eternal limit. Skeleton = quantum fields, stable particles, atoms – conservative structures. Dance = dissipative attractors – minds, life, society.

14. Open Questions for Future Work

- **Formal cross-scale unification:** How can we unify conservation-based stability (QFT) and dissipative attractors (nonlinear dynamics) with a single mathematical object?
- **Dissipation-consciousness link:** Is dissipation absolutely necessary for consciousness, or just a fact about life on Earth?
- **ECM mechanism:** What is the exact chain from ECM changes to nervous system regulation to subjective feelings?
- **Persistence vs. selection:** Is persistence a basic feature of reality, or do we only notice stable things because unstable ones vanish?
- **Fantasy attractor measurement:** Can we really measure correction latency, basin depth, and external coupling in real social systems?
- **Coupling equations:** How exactly does the rate of memory inscription depend on metronome frequency? (See the *Threefold Anchor* paper for a working placeholder.)

15. Conclusion

The attractor framework gives a naturalistic picture of reality:

- **Non-dissipative (conservative) structures** – the eternal, mindless skeleton, anchored by the three fundamental metronomes (electron, neutrino mass eigenstates, proton).
- **Dissipative attractors** – temporary, energy-hungry, and mortal. All minds are in this class.
- **What binds all dissipative systems** is the continuous recycling of the same three eternal metronomes.
- The universe as a whole is non-dissipative, therefore not a mind.
- A theistic God is extremely implausible under this framework.

We don't need religious language. We have the eternal skeleton and the transient dance: persistence without transcendence, structure without the supernatural.

The dance is finite, fragile, and precious. The skeleton is eternal, but mindless.

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This rewrite is ready to replace the old post. It now correctly reflects the threefold metronome framework, includes the recycling insight, and cross-references the newer paper.

Sleep as Attractor Maintenance: Glymphatic Clearance, Synaptic Rescaling, and Dynamical Resilience

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Date: May 2026

Preprint available at: <https://fantasyattractor.com/>

Abstract

Sleep is often called “hardware maintenance” (deep sleep) and “software maintenance” (REM sleep).

This paper re-interprets sleep using the **attractor framework**, where your mind is a dissipative attractor of your whole body.

We propose that different sleep stages are different **attractor regimes**:

- **Deep (NREM) sleep** – a slow, relaxing state that clears waste and dials down brain connections.
- **REM sleep** – a fast, high-dimensional attractor that updates your brain’s internal model.

We review evidence for:

- Glymphatic clearance (waste removal)
- Synaptic homeostasis (downscaling of connections)
- Slow-oscillation/spindle coupling
- Sleep-immune interactions

We also show how sleep fragmentation, ageing, chronotypes, and sleep disorders can be understood as changes in **attractor depth, stability, and corrective permeability**.

The framework introduces a **persistence functional** $P(x)$ – a single number that measures basin depth – which could be estimated from EEG or wearables to predict resilience to sleep loss and guide closed-loop interventions.

1. Introduction

In the attractor framework, your mind is a **dissipative attractor of your whole body** – a pattern that needs constant energy, can be disturbed, and can adapt.

Sleep is a natural, periodic disturbance that lets the system reset, repair, and reorganise. It is **not** passive; it is an **active attractor maintenance process**.

We focus on two major sleep stages:

- **NREM sleep**, especially deep slow-wave sleep (NREM 3) – a **slow constraint relaxation** that brings the brain and body back to a low-energy baseline.
- **REM sleep** – a **fast, high-dimensional attractor** for active reorganisation, memory consolidation, and predictive coding updates.

This paper bridges sleep neuroscience with the attractor framework.

What does the framework add?

- **Integration** – a common language across scales.
 - A **unified quantitative biomarker** $P(x)$ from EEG or wearables.
 - **Novel predictions** (e.g., wearable early-warning signals, REM-emotional rebound) that are not obvious from the individual component theories.
- This is **generative integration** – a scientific contribution even without claiming new mechanisms.
-

2. The Attractor Framework Primer

- **Conservative attractors** (the “six metronomes”) – eternal, time-symmetric, provide steady rhythms. They are the floor, not part of maintenance.
- **Dissipative attractors** (life, mind, society) – need energy flow, have finite lifetimes, can evolve. The brain is a nested stack of dissipative attractors.
- **Persistence under perturbation** – a resilient system returns quickly to its attractor after a disturbance.
- **Self-engineering** – using small, repeated disturbances to reshape your own attractor. Sleep is a natural self-engineering cycle.

Sleep moves you through: **wake → NREM → REM → wake**.

3. NREM Deep Sleep – Slow

Constraint Relaxation

3.1 Glymphatic clearance – flushing out waste

Deep slow-wave sleep (NREM 3) is essential for clearing brain waste.

Studies show that the glymphatic system (which removes waste) works best during deep NREM (Iliff et al., 2012). Norepinephrine drops during sleep, expanding the space around cells and improving fluid flow (Balkrishnan et al., 2023, conference abstract).

In attractor terms: The deep-sleep attractor (high delta power) relaxes the metabolic constraints that build up during the day. Waste clearance rate scales with **attractor depth** (measured by slow-wave activity, SWA). Shallow or broken sleep leads to waste buildup.

3.2 Synaptic homeostasis – resetting brain connections

The synaptic homeostasis hypothesis (SHY) says:

- Wakefulness strengthens synapses (deepens attractor basins).
- NREM sleep downscale synapses (shallows basins) (Tononi & Cirelli, 2006).

SWA reflects this – it is high after waking and declines across the night.

In attractor terms: The persistence functional $P(x)$ would be high after waking, then drop during NREM as synapses downscale. The rate is steep early and plateaus later – compatible with critical slowing down near awakening (though

direct evidence is mixed).

3.3 Slow-oscillation–spindle coupling – nested rhythms

Memory consolidation during sleep depends on the tight coordination of:

- Cortical slow oscillations (<1 Hz)
- Thalamocortical spindles (12–15 Hz)

This is best described as **nested oscillatory coupling** (Ngo et al., 2013) – the slow oscillation modulates excitability, creating windows for spindles.

We interpret this as **different timescales within a single attractor manifold** (parsimonious). (Two coupled attractors could also produce phase locking; the question is subtle, but we take the simpler view.)

Stronger phase-locking between spindles and slow oscillations predicts better memory. Closed-loop stimulation (auditory or electrical) timed to the up-phase enhances both slow waves and spindles – showing that the attractor can be externally reinforced.

4. REM Sleep – Fast, High-Dimensional Attractor

REM sleep has activated EEG (low voltage, fast rhythms) and vivid dreaming.

From a **predictive coding** view (Friston, 2010), REM updates the brain's generative model by resolving prediction errors.

Dynamically, the NREM → REM transition is a **phase bifurcation**:

- NREM is a low-dimensional attractor (regular slow oscillations).
- REM is higher-dimensional (complex, desynchronised EEG).

Indeed, EEG complexity (e.g., Lempel-Ziv complexity) is higher in REM and wake than in NREM.

If REM dreaming implements predictive coding, then nights with stronger REM (longer, more intense periods) should show greater emotional memory consolidation. (The idea of lucid dreaming as a “meta-attractor” is not pursued here.)

5. Sleep Fragmentation and Attractor Instability

Frequent awakenings (fragmentation) repeatedly disturb the sleep attractor.

Each arousal is a temporary escape from the NREM or REM basin, reducing effective depth and slowing re-entry. This is a state of **reduced attractor stability** with **critical slowing down** (Scheffer et al., 2009): recovery takes longer.

Recent work (de Mooij et al., 2020) found that EEG change-points – transitions between stages – are often preceded by early-warning signals (rising variance and autocorrelation).

Grossman et al. (2025) showed that the wake-to-sleep transition follows a bifurcation dynamic, detectable minutes before sleep onset.

Wearables (HRV, actigraphy) could detect similar signs – rising movement variance, increasing HRV autocorrelation – before a failed sleep transition. Closed-loop auditory tones could then reinforce the desired attractor.

6. Inter-individual Differences, Aging, Chronotypes, and Immune Coupling

Resilience to sleep loss

People vary widely. The **PER3 clock gene polymorphism** is a paradox:

- **PER3^{5/5}** individuals have more slow-wave sleep and higher delta power, yet they suffer **greater** performance declines under sleep loss (Viola et al., 2011).

This shows that a deeper baseline attractor does **not** guarantee resilience. The framework says resilience requires not only depth but also **corrective permeability** – the ability to re-enter deep sleep after an awakening and to update the attractor under stress (see Section 7).

Aging

Slow-wave sleep drops dramatically with age. In a community study, each 1% annual reduction in SWS was linked to a 27% higher risk of dementia (Himali et al., 2023).

In attractor terms: the deep-sleep basin **erodes** with age, and corrective permeability weakens. Exercise, light therapy, and melatonin may help a little, but only modestly.

Chronotypes

Morning larks and night owls differ mainly in the **phase** of the sleep–wake attractor relative to the light–dark cycle. Both can have similar basin depths, but misalignment may weaken the

attractor.

Sleep-immune coupling

Sleep deprivation increases pro-inflammatory cytokines (IL-6, TNF- α) and reduces T-cell activity (Irwin et al., 2016; Besedovsky et al., 2012).

A shallow or fragmented sleep basin destabilises the immune attractor, leading to slower recovery from infection (Cohen et al., 2009) and blunted vaccine responses (Spiegel et al., 2002).

Immune challenge (e.g., infection) also disrupts sleep, increasing SWS – a “sickness behaviour” attractor shift (Krueger et al., 2013). This is **bidirectional coupling** between two attractor landscapes.

Framework-specific prediction: Corrective permeability κ should be **lower** on nights following an immune challenge, independently of changes in delta power.

(Statistical test: partial correlation or regression of κ on immune challenge, controlling for PEEG/EEG.) This prediction is not deducible from the cytokine model alone.

7. Sleep Disorders as Maladaptive Attractors and Corrective Permeability

7.1 Defining corrective permeability κ

κ measures how quickly a system returns to its primary attractor after a disturbance and how easily it updates under chronic stress. $\kappa = 1/\tau_{\text{recovery}}$ $\kappa = \tau_{\text{recovery}}^{-1}$

where τ_{recovery} (minutes) is the time from an awakening back to stable deep NREM (stage 3).

- High $\kappa > 0.2 \text{ min}^{-1} \rightarrow$ fast recovery ($< 5 \text{ min}$).
- Low $\kappa < 0.05 \text{ min}^{-1} \rightarrow$ poor recovery ($> 20 \text{ min}$).

These thresholds are provisional – for empirical calibration.

Heart-rate recovery slope after awakenings is a candidate wearable proxy (hypothesis, not yet validated).

7.2 Disorder taxonomy

- **Insomnia** – abnormally shallow sleep attractor (low depth) **and/or** low κ . Hyperarousal prevents settling into deep sleep.
- **Narcolepsy** – blurred boundary between wake and REM attractors (orexin loss).
- **REM behaviour disorder** – failure of REM attractor to suppress muscle activity; dream movements “leak out”.

7.3 Falsification conditions

Falsification of the “shallow basin” explanation

If an insomnia patient shows normal delta power ($PEEG > 0.7$) **and** normal corrective permeability ($\kappa > 0.1$) but still has non-restorative sleep, the “shallow basin” model is falsified for that patient.

The framework would be incomplete, not wrong. **But** to prevent this clause from making the theory unfalsifiable, we add a provisional bound:

If more than 30% of diagnosed insomnia cases need such additional mechanisms, the framework’s descriptive utility for insomnia would be in question, and the core hypothesis would be falsified.

Falsification of the attractor framework itself

If sleep stage transitions show **no** evidence of basin-crossing dynamics (no rise in variance/autocorrelation, no attractor dimensionality difference between NREM and REM, no critical slowing down before awakening), then the attractor framework should be abandoned in favour of a purely stochastic or oscillator-based model.

Specifically, a well-powered study using the methods of de Mooij et al. (2020) that finds null results would constitute strong falsification. (We require convergent null evidence across multiple measures.)

8. The Persistence Functional $P(x)$

$P(x)$ measures attractor depth – the ability to resist disturbance and return to stable state.

We base it on the **dominant Lyapunov exponent** λ_1 .

Primary definition (fixed $\tau=1$ s): $P_{\text{raw}} = e^{-\lambda_1 \cdot \tau}$

For a stable attractor, $\lambda_1 < 0$, so $P_{\text{raw}} > 1$. Deeper attractors (more negative λ_1) give larger P_{raw} .

To get a bounded $[0,1]$ measure: $P_{\text{norm}} = \frac{1}{1 + e^{\lambda_1 \tau}}$

- Values near 1 → deep basin.
- 0.5 → neutral.
- Near 0 → unstable/chaotic.

EEG-practical approximations:

- **Correlation dimension D_2** – in sleep EEG, deeper stages have lower D_2 . This is

a **sleep-specific** approximation.
Then $P \propto 1/(1+D^2) P \propto 1/(1+D^2)$.
▪ **Delta power ratio** (simplest):

$$PEEG = \langle \delta(t) \rangle \delta_{wake} + \langle \delta(t) \rangle PEEG_{\square} = \delta_{wake} + \langle \delta(t) \rangle \langle \delta(t) \rangle$$

where $\langle \delta(t) \rangle \langle \delta(t) \rangle$ is mean delta power (0.5–4 Hz) in the epoch, and δ_{wake} is the same during relaxed wakefulness.
Deep sleep → value close to 1; shallow sleep → near 0.

We recommend $PEEG_{\square}$ for practical sleep research. All three definitions should correlate under the framework’s assumptions, but empirical validation is needed.

9. Testable Predictions

Prediction	Type	Proposed Test Protocol	Source / Support
Glymphatic clearance correlates with SWA	Retrodiction	–	Iliff et al., 2012
EEG complexity decreases across NREM	Retrodiction	–	Tononi & Cirelli, 2006
S0–spindle coupling predicts memory	Retrodiction	–	Ngo et al., 2013
Sleep fragmentation preceded by rising variance/autocorrelation	Novel	Re-analyse existing sleep EEG datasets	de Mooij et al., 2020; Grossman et al., 2025

Prediction	Type	Proposed Test Protocol	Source / Support
Wearable early-warning signals (HRV lag-1 autocorrelation) predict night-to-night sleep quality	Novel	Pilot N=1 wearable study (30+ nights); confirm with larger cohort	Proposed here
REM rebound scales with emotional load during wake	Plausible	Daily stress diary (1–10) + actigraphy/PSG for REM%	Proposed here
Immune challenge reduces next-night $\kappa\kappa$ independently of delta power	Novel (framework-specific)	Controlled immune challenge (e.g., vaccine) with wearable/PSG $\kappa\kappa$; partial correlation controlling for PEEGP EEG	Proposed here

Falsification of core framework: If no evidence of basin-crossing dynamics (rising variance/autocorrelation, difference in attractor dimensionality) is found in a well-powered EEG study using de Mooij et al.'s methods, the attractor framework for sleep should be abandoned.

10. Conclusion

Sleep is not passive – it is a dynamic, bifurcated process of **attractor maintenance**.

- **Deep NREM sleep** – slow constraint relaxation, clearing waste and downscaling synapses.
- **REM sleep** – fast, high-dimensional attractor, updating the brain's generative model.

Fragmentation, aging, and sleep disorders can be understood as changes in attractor depth, stability, and corrective permeability.

The persistence functional $P(x)P(x)$ gives a quantitative language for sleep engineering.

The dance of sleep is the dance of maintenance – and we can learn to engineer it.

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The Sperm and the Dome: An Ancient Pattern

Robert Galida <https://fantasyattractor.com/>

May 2026

You have seen the diagram.

It appears in biblical studies textbooks, online articles about ancient Near Eastern cosmology, and even on apologetics websites trying to explain away the plain meaning of Genesis.

A flat disc earth.

A solid dome (*rāqīa'*) above.

A cosmic ocean below.

The sun, moon, and stars move inside the dome.

Rain enters through literal windows in the sky.

It looks primitive.

Like a child's drawing of a snow globe.

But look again. Squint. Rotate the image ninety degrees.

What do you see?

A sperm.

A single, potent, ordered structure swimming through an infinite ocean.

- The **head** is the dome – the firmament containing the

celestial lights.

- The **midpiece** is the flat disc of the earth – the solid ground where life emerges.
- The **tail** is the cosmic ocean below – the chaotic, fertile waters from which everything springs.

And the whole thing is adrift in an infinite, dark, supportive medium – the same infinite ocean that appears in Genesis as the *tehom* (the deep), the primordial waters over which the Spirit of God hovers.

This is not a coincidence.

It is a **pattern**.

The Attractor Framework: A Lens

In my attractor framework, **persistence under perturbation** is the fundamental mark of reality.

Two classes of attractors exist:

- **Conservative attractors** – the eternal skeleton: electrons, protons, neutrinos, photons. They are time-symmetric, unchanging, and provide the invariant rhythms of the universe (the “metronome”).
- **Dissipative attractors** – the transient dance: life, mind, society, and everything that requires energy flow, exports entropy, and eventually runs down.

A sperm is a **low-entropy conservative structure** – a packet of highly ordered information (DNA) that is relatively stable and fuel-efficient.

It swims through a **high-entropy dissipative environment** – the chaotic, nutrient-rich ocean of potential.

Its journey is a perturbation.

Fertilisation, when it succeeds, is a **phase transition**: the emergence of a new, more complex attractor (the zygote) from the coupling of two initial basins (sperm and egg).

The subsequent explosion of growth – cell division, differentiation, morphogenesis – is the **transient dance** of life.

The Ancient Mind Saw the Same Pattern

The biblical authors had no microscopes. They could not see a sperm cell.

But they observed the world around them, and they projected the **microcosmic pattern of fertilisation** onto the **macrocosmic canvas of the sky**.

- The **infinite ocean** is the primordial *tehom* – the raw, undifferentiated potential before creation.
- The **sperm** is the *rāqīa'* – the solid dome that separates and organises the waters above from the waters below.
- The **fertilised egg** is the cosmos itself – the flat disc of the earth, the lights in the dome, the living creatures on the land.

The ancient author of Genesis was not a scientist.

But he was a **pattern-recogniser**.

He intuited that the universe begins as a single, ordered perturbation in an infinite, chaotic sea.

That is not primitive superstition.

That is **dynamical intuition**.

The Cosmic Conception Hypothesis

Modern science has its own version of this same pattern.

The “cosmic conception hypothesis” (found in some theoretical papers) compares the fertilisation of a galaxy by a supermassive black hole to the fertilisation of an egg by a sperm.

The black hole is the seed; the galaxy is the developing organism.

The same archetype recurs because it is **structurally necessary**: any self-organising system that emerges from a homogeneous background must be born as a localised, ordered perturbation.

The Genesis diagram is not a mistake.

It is a **map**.

The Sperm in the Infinite Ocean

When you look at that ancient Near Eastern cosmology diagram – the flat earth, the solid dome, the cosmic ocean – you are looking at a **sperm in an infinite ocean**.

The author could not have known this consciously.

But the attractor of reality – the deep structure of persistence under perturbation – guided his hand.

- The infinite ocean is the potential.
- The sperm is the first perturbation.
- The fertilised egg (the cosmos) is the new attractor basin.
- And the dance of life – stars, planets, minds,

civilisations – is the transient, dissipative dance that follows.

The diagram is not a coincidence.

It is a **necessary projection of a universal dynamic.**

The sperm and the dome are the same pattern, separated by millennia and scale.

You are free to see it or not.

But once you see it, you cannot unsee it.

The mountain does not negotiate.

Neither does the Hebrew text.

Neither does the sperm.

Published at: fantasyattractor.com

You are free to see it or not. But once you see it, you cannot unsee it. The mountain does not negotiate. Neither does the Hebrew text. Neither does the sperm.

Author: Robert Galida

Date: May 2026

Published at: fantasyattractor.com

**Whirling as Attractor
Engineering: Chirality,**

Shared Resonance, and a Minimal-Dose Protocol for Whole-Body Resilience

Author: Robert Galida

Date: May 2026 (Revised June 2026)

□ **Note (June 2026):** This paper's description of conservative attractors has been updated to reflect the refined framework in *Metronome, Memory, and the Threefold Anchor: A Relational Account of Time* [F] (2026). The health and self-engineering content is unchanged.

Abstract

Whirling – the spinning practice of Mevlevi dervishes – is often seen as a mystical ritual. This paper reinterprets it through the attractor framework, where the mind is a dissipative attractor of the whole body.

Whirling is a controlled, repeated perturbation. It trains your balance, nervous system, and heart to settle into a stable, coherent pattern – a form of attractor engineering.

We discuss two additional ideas:

- **Chirality alignment** – spinning counter-clockwise may symbolically align with the universe's handedness (e.g., left-handed neutrinos), but this is speculative and not needed for health benefits.
- **Shared resonance** – group whirling synchronises

heartbeats, creating a collective attractor.

We review scientific evidence showing that whirling improves heart rate variability (HRV), sleep quality, anxiety, brain plasticity, and physical fitness. A minimal effective dose is 5–15 minutes per day, 3–4 times per week. A graduated protocol is provided.

The health benefits are real. The chirality interpretation is optional.

1. Introduction

In the attractor framework, your mind is a dissipative attractor of your whole body – a pattern that needs energy flow to stay stable, can be disturbed, and can adapt. Self-engineering means using small, repeated disturbances to reshape your own attractor towards greater resilience.

Whirling is a sustained, counter-clockwise spin performed by Mevlevi dervishes for centuries. It is spiritual, but modern science has found clear physical and mental benefits.

This paper argues that whirling is a powerful attractor engineering practice: a rhythmic whole-body disturbance that forces your system to become more stable and coherent. We also explore two extra ideas:

- **Chirality** (spinning with the universe's "handedness" – speculative)
- **Shared resonance** (heartbeat synchronisation in groups – well supported).

2. The Attractor Framework Primer (Very Brief)

- **Conservative attractors** are eternal, time-symmetric, and require no energy input. They form the *eternal skeleton*. The three most fundamental conservative attractors – the *metronomes* – are the **electron, neutrino mass eigenstates** (collectively), and **proton**. (The photon is a signal carrier, not a metronome; see *Metronome, Memory, and the Threefold Anchor* for details.)
- **Dissipative attractors** (life, mind, society) need energy flow, have finite lifetimes, and can change. Your body is a stack of dissipative attractors.
- **Persistence under disturbance** is the basic mark of reality. A resilient system returns to its attractor after a knock.
- **Self-engineering** uses small, repeated nudges to reshape your own attractor basin.
- **Whirling** is a strong, repeated disturbance. Your body must adapt. That adaptation is the engineering.

3. Chirality Alignment – A Speculative Interpretation

3.1 What do we know about universal handedness?

- **Weak interactions:** Neutrinos produced in weak decays are always left-handed (Wu experiment, 1956). This is a fact. But electrons and protons do not have a universal spin direction.

- **Astronomical rotations:** From the north pole, Earth, the solar system, and the Milky Way rotate counter-clockwise. From the south pole, they appear clockwise. That's just a viewpoint – there is no privileged direction in space.
- **Cosmic Microwave Background:** Some studies suggested a preferred axis (“axis of evil”), but these results are contested and likely statistical artifacts. No clear evidence.

3.2 The speculative claim

The dervish's counter-clockwise spin can be seen as a heuristic alignment with these physical handednesses (neutrino helicity, frame-dependent rotation). In our attractor framework, we propose that spinning with the majority direction (as seen from the northern hemisphere) may resonate symbolically and phenomenologically with the invariant rhythms of the conservative substrate – the three metronomes.

Crucially, there is no known physical mechanism linking a rotating body (~1–2 rpm) to particle spin or photon polarisation. The scale difference is huge. So this alignment is presented as a speculative metaphysical claim within our framework, not as proven physics. It's a way to frame the practice, not a testable hypothesis. The health benefits of whirling do not depend on this speculation.

3.3 Clockwise vs. counter-clockwise

No study has compared clockwise and counter-clockwise whirling for health effects. The idea that clockwise spinning “needs more energy” or “opposes the Tao” is unsupported – we label it as speculation. You can try both directions, but the traditional counter-clockwise spin is recommended for alignment with our framework's interpretive preferences.

4. Shared Resonance: Heartbeat Synchronisation

A published study measured heart rates during a group Sufi whirling ritual. It found that participants' heartbeats became synchronised – the biological data matched the spiritual goal of unity.

In attractor terms: the shared rhythm creates a common basin of attraction across people. Each body locks onto the same external rhythm (the group spin), and through mutual coupling, their cardiac oscillators fall into step.

This is like metronomes placed on a movable platform – they eventually synchronise (a classic demonstration from Huygens, 1665). Here, the “platform” is the shared sound and feel of the group whirling. The result is a collective attractor – a stable shared state where heart rates align, possibly amplifying resilience.

Note: The term “collective attractor” simply means a stable pattern in a coupled system. The 2019 study showed cardiac synchronisation, but the idea that whirling together increases resilience beyond what you can do alone is still a plausible hypothesis that needs testing.

5. Evidence for Health Benefits

5.1 Heart Rate Variability (Autonomic Resilience)

A 2012 study on “Whirling-Kung” (5–15 minutes, three times per week) found the practice prevented a decline in key HRV measures (SDNN, total power) seen in a control group. Higher

HRV means a wider attractor basin, faster recovery, and greater resilience.

5.2 Sleep Quality and Stress Markers

A 2022 study on whirling dervishes found significantly better sleep quality and much lower anxiety ($p < 0.001$) compared to non-whirling controls. The dervishes also had lower levels of VEGF, BDNF, and GDNF – markers often elevated by chronic stress.

Note on BDNF: Lower BDNF is usually linked to depression, not less stress. The authors of the study interpreted this as a possible protective effect, but the relationship is complex. We simply report the finding without endorsing a specific interpretation.

5.3 Neuroplasticity – Reshaping the Brain's Attractor Landscape

An MRI study found that long-term dervishes have cortical thinning in the default mode network (DMN) and motion-perception areas (right DLPFC, lingual gyrus, visual area V5). This thinning is experience-dependent neuroplasticity: the brain prunes inefficient connections to become more specialised.

5.4 Physical Fitness and $VO_2\text{max}$

A 12-week whirling training programme improved body composition, leg strength, flexibility, grip strength, and both anaerobic and aerobic power ($VO_2\text{max}$). Whirling is effective whole-body cardiovascular exercise.

5.5 Mental Health – Less Anxiety, Better Self-Regulation

Multiple studies confirm lower anxiety. Participants report better mind-body focus, self-regulation, positive feelings, and a “quietness in the centre of the vortex” – the subjective

experience of a stable core attractor.

Finding the original studies: The papers cited here (2012 HRV, 2022 sleep/anxiety, MRI, 12-week fitness, and the 2019 heartbeat study) can be found by searching terms like “whirling dervish heart rate variability,” “whirling kung HRV,” “Dursun whirling MRI,” “Karakaya whirling sleep,” or “Genc whirling V02max.”

6. The Minimal Effective Dose

Based on the 2012 study and traditional practice:

- 5–15 minutes per session
- 3–4 times per week
- Counter-clockwise rotation (traditional; clockwise not harmful but lacks evidence)
- Gradual progression

Phase	Duration	Frequency	Goal
Adaptation (weeks 1–2)	5 min	3–4x/week	Get used to the spin
Consolidation (weeks 3–4)	10–15 min	3–4x/week	Find the rhythm, notice calm
Expansion (week 5+)	20–30 min	3–4x/week	Explore deeper states

7. Practical Instructions

- **Space:** A large, empty room. Bare feet.
- **Posture:** Start with arms crossed on your chest. Begin

turning counter-clockwise. After a few revolutions, open your arms: right hand up (palm to sky), left hand down (palm to earth).

- **Gaze:** Soft, unfocused – don't fixate on a single point.
 - **Safety:** Stop if you feel severe nausea. Use a wall for support if needed.
 - **Afterward:** Rest lying down for 5–10 minutes to let your balance system settle.
-

8. Conclusion

Whirling produces real, measurable benefits: better HRV, sleep, anxiety, brain plasticity, and fitness. A minimal dose of 5–15 minutes a day, three to four times a week, is enough.

The shared resonance (heartbeat synchronisation in groups) is empirically supported.

The chirality alignment (spinning counter-clockwise to align with the universe) is a speculative interpretation – not required for the health benefits.

The dervish's spin is a dance of persistence under perturbation – a transient dancer humming along with the eternal skeleton. The dance has a new step.

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The Cosmology of Genesis: Flat Earth, Solid Dome, and Cosmic Ocean

A Plain-Language Guide to What the Bible Actually Says

Robert Galida – Independent Researcher

<https://fantasyattractor.com/>

May 2026

Note on genre: This is an open letter and historical-philological analysis, not a peer-reviewed journal article. It draws on mainstream biblical scholarship, standard Hebrew lexicons, and ancient Near Eastern comparative materials. The primary evidence comes from narrative and descriptive passages (Genesis 1, Job 37–38, Ezekiel 1, etc.). The analysis is addressed to scholars who have dismissed the flat-earth reading as “silly.”

Abstract

This paper examines the physical description of the universe in the Hebrew Bible. Using standard Hebrew dictionaries (BDB, HALOT, Holladay), ancient Near Eastern texts, and the plain meaning of the biblical passages, we show that the biblical authors believed:

- The earth is a **flat disc**.
- A **solid dome** (*rāqīaʿ*, “firmament”) covers it, separating the waters below from a **cosmic ocean above**.
- The sun, moon, and stars move inside this dome.
- Rain enters through literal **windows** or **sluices** in the dome.
- The earth rests on **pillars** and **foundations**, and has **ends** and **corners**.

We provide a representative list of verses, address common apologetic reinterpretations, and reference standard scholarly reconstructions of ancient Hebrew cosmology. The Bible’s cosmology closely matches those of Mesopotamia and Egypt. This poses no problem for a non-inerrancy reading, but it is a severe challenge for any claim of divine scientific inerrancy.

Introduction: What Did the Biblical Authors Actually Believe?

The question is not whether the Bible is “true” in a theological or moral sense. The question is: **what did its human authors believe about the physical structure of the world?**

Modern readers often project a post-Copernican, spherical, heliocentric universe onto the ancient text. But a straightforward reading – using standard Hebrew lexicons and the context of the ancient Near East – shows that the Hebrew Bible shares the common model of a flat earth under a solid sky-dome, with a cosmic ocean above and below.

For standard scholarly reconstructions (with diagrams), see:

- [Bible Odyssey \(Society of Biblical Literature\)](#) –

includes a clear diagram of the flat earth, solid dome, and cosmic waters.

- [Wikimedia Commons](#) – a modern, clearly labelled reconstruction.
- [Biblical Archaeology Society](#) – comparative diagrams of Israelite, Babylonian, and Egyptian models.

For print references, see Smith (1998) and Keel (1997).

The Solid Dome: *Rāqīaʿ* (רָקִיעַ)

The word *rāqīaʿ* occurs 17 times in the Hebrew Bible. Its verbal root *rāqaʿ* (רָקַע) means “to beat, stamp, or spread out by hammering” – the same word used for beating metal into thin plates (Exodus 39:3). The noun denotes a **solid, hammered-out dome**.

Lexical Evidence

Lexicon	Definition
Brown-Driver-Briggs (BDB)	“Extended surface, (solid) expanse (as if beaten out)”
Holladay	“Beaten metal ‘plate’, firmament (i.e. vault of heaven, understood as a solid dome)”
Koehler-Baumgartner (HALOT)	“Firmament, vault of heaven, understood as a solid dome”

Key Verses by Genre

Narrative (primary evidence)

- **Genesis 1:6–8** – God says, “Let there be a *rāqīaʿ* in the

midst of the waters, and let it separate the waters from the waters.” He calls the *rāqīaʿ shamayim* (sky/heaven). The dome is placed inside a cosmic ocean, dividing “waters below” from “waters above.”

- **Genesis 1:14–18** – The sun, moon, and stars are placed **inside** the *rāqīaʿ*. They are not above the dome; they are embedded in its inner surface.

Wisdom poetry (corroborative)

- **Job 37:18** – “Can you, like Him, spread out the skies, hard as a mirror of cast metal?” This unambiguously describes solidity.

Apocalyptic vision (structural)

- **Ezekiel 1:22–26** – Above the living creatures is “something like a *rāqīaʿ*, sparkling like ice (or crystal).” Above this *rāqīaʿ* is the throne of God. This is a solid platform, not empty space. Even though Ezekiel’s vision is symbolic, it describes physical properties (solid, crystalline) as part of the visionary architecture.

Hymnic (doxological, not load-bearing)

- **Psalms 19:1** – “The heavens declare the glory of God; the skies (*rāqīaʿ*) proclaim the work of His hands.”
- **Psalms 150:1** – “Praise God in His sanctuary; praise Him in His mighty *rāqīaʿ*.”
- **Daniel 12:3** – “Those who are wise will shine like the brightness of the *rāqīaʿ*.”

These do not prove solidity on their own, but they assume the same conceptual framework. No text contradicts the solid-dome

interpretation.

Ancient Translations

- **Septuagint** (3rd century BCE, Jewish translation): *stereōma* (στερέωμα) – a solid or firm structure.
- **Latin Vulgate**: *firmamentum* – something firm, a support.

Scholarly Confirmation (Including Believing Scholars)

- **Seely (1991–1992)** – Demonstrates that *rāqīaʿ* in context refers to a solid dome.
- **Walton (2011)** – Affirms that the ancient Israelites believed in a solid *rāqīaʿ*, even though his main argument is that Genesis 1 assigns functions rather than making material claims.
- **Greenwood (2015)** – “A vaulted dome above the earth, a ‘firmament,’ like the ceiling of a planetarium.”
- **Parry (2014)** – “A flat earth at the centre of the cosmos, with a vast ocean in the sky.”

The Waters Above – A Cosmic Ocean

If the dome is solid and separates “waters above” from “waters below”, those waters must be literal.

- **Genesis 1:6–7** (as above).
- **Psalms 148:4** – “Praise Him, highest heavens, and you waters above the heavens.”
- **Genesis 7:11** – “All the fountains of the great deep

burst forth, and the windows of the heavens were opened.” The word *arubbah* means “lattice window” or “sluice.” Rain comes through openings in the solid dome.

- **Genesis 8:2** – “The fountains of the deep and the windows of heaven were closed.”
 - **2 Kings 7:2, 19** – “The Lord will open the windows of heaven.”
 - **Isaiah 24:18** – “The windows of heaven are opened, the foundations of the earth tremble.”
 - **Malachi 3:10** – “See if I will not open the windows of heaven and pour out blessing.”
-

The Flat Earth: Pillars, Foundations, Ends, and Corners

A spherical earth does not have pillars, foundations, ends, or four corners. The Bible uses all these terms repeatedly.

Pillars of the Earth

- **1 Samuel 2:8** – “For the pillars of the earth are the Lord’s, and on them He has set the world.”
- **Job 9:6** – “He shakes the earth out of its place, and its pillars tremble.”
- **Psalms 75:3** – “When the earth and all its dwellers quake, it is I who bear its pillars firmly.”
- **Job 26:11** – “The pillars of heaven tremble and are stunned at His rebuke.”

Foundations of the Earth

- **Psalms 104:5** – “He set the earth on its foundations, so

that it should never be moved.”

- **Job 38:4–6** – “Where were you when I laid the foundations of the earth? ... On what were its bases sunk?”
- **2 Samuel 22:8** – “The foundations of the heavens shook.”

Ends of the Earth (assumes a bounded earth)

- **Deuteronomy 28:49** – “A nation from afar, from the end of the earth.”
- **Isaiah 45:22** – “Turn to Me and be saved, all you ends of the earth.”
- **Psalms 67:7** – “All the ends of the earth will fear Him.”
- **Psalms 72:8** – “He shall have dominion from sea to sea... to the ends of the earth.”

Four Corners of the Earth

- **Isaiah 11:12** – “He will assemble the scattered of Judah from the four corners of the earth.” The word *kanpôt* (wings/edges) is a directional idiom whose origin in a flat-earth, bounded-space worldview is widely recognised.

The Vaulted Dome Over a Flat Disc

- **Amos 9:6** – “The One who builds His upper chambers in the heavens and has founded His vaulted dome over the earth.”
- **Isaiah 40:22** – “He sits enthroned above the circle of the earth.”

On *chûg* (“circle”)

The word *chûg* occurs in three places: Job 26:10 (“He has inscribed a circle on the face of the waters” – a flat circular boundary), Proverbs 8:27 (same), and Isaiah 40:22. The Akkadian cognate *khâqu* means “to draw a circle.” The Septuagint translates *chûg* as *gyros* (circle), not *sphaira* (sphere). The same verse also says God “stretches out the heavens like a curtain” – a flat surface, not a spherical shell.

Therefore, *chûg* denotes a **disc**, not a ball.

The Cosmic Ocean Below

- **Genesis 7:11** – “The fountains of the great deep burst forth.” (Subterranean ocean)
 - **Psalms 24:2** – “For He has founded it upon the seas and established it upon the rivers.”
 - **Exodus 20:4** – “You shall not make an idol... of anything that is in the waters under the earth.”
 - **Psalms 136:6** – “He spread out the earth upon the waters.”
-

Comparison with Ancient Near Eastern Cosmologies

The Hebrew cosmology is closely analogous to those of Israel’s neighbours.

- **Mesopotamia:** The *Enuma Elish* describes Marduk fixing a

solid sky-barrier to hold back the cosmic waters. This is the functional equivalent of the Hebrew *rāqīaʿ*.

- **Egypt:** The sky goddess Nut arches her body over the earth god Geb, forming a solid vault with stars attached. The Pyramid Texts describe the sky as “a metal vault” or “iron” – directly parallel to Job 37:18 (“hard as a mirror of cast metal”).

The Hebrew *rāqīaʿ* fits comfortably within this regional intellectual context. The Bible is not scientifically unique; it reflects the common ancient Near Eastern worldview.

Geocentric Passages (Consistent with the Model)

These verses are not flat-earth proof on their own, but they presuppose a geocentric, non-rotating, bounded cosmos – fully consistent with the flat-earth, solid-dome model.

- **Joshua 10:12–13** – The sun and moon stand still at Joshua’s command. This implies a moving sun and a non-rotating earth.
- **2 Kings 20:11 / Isaiah 38:8** – The shadow on the sundial moves backward. Again implies a geocentric system.
- **Ecclesiastes 1:5** – “The sun rises and the sun sets, and hurries to its place where it rises.” Phenomenological geocentrism.
- **Psalms 19:4–6** – The sun runs its circuit from one end of the heavens to the other.

These passages are not necessary to demonstrate flat-earth cosmology, but they are part of the broader biblical cosmic picture.

The Verse Often Misused by Apologists: Job 26:7

Job 26:7 – “He stretches out the north over the void and hangs the earth on nothing (*belî-māh*).”

This is the only verse that might suggest a free-floating earth. However:

- *Belî-māh* is a rare construction; it may mean “**without any visible support**,” not “without any support at all.” Clines (1989) notes that the phrase indicates “no visible means of support” rather than absolute suspension.

One ambiguous verse does not overturn the dozens that describe pillars, foundations, and a solid dome. The majority witness of the Hebrew Bible is flat-earth, solid-dome cosmology. If Job 26:7 is taken as a late, more abstract cosmological statement, it represents a minority view and does not negate the consistent picture in Genesis, Psalms, and other prophets.

The Inerrancy Dilemma (and the Phenomenological Language Defence)

If one affirms that the Bible is a human document, the presence of ancient cosmology presents no crisis. But if one claims divine inerrancy – that the Bible is without error in all that it affirms – one faces a dilemma:

- **Admit** that God described His creation in terms that are scientifically false (a flat earth, a solid dome).
- **or Reinterpret** the plain meaning as metaphor or accommodation – but then the words lose stable meaning, and any verse can be explained away.

A common inerrantist response is the “phenomenological language” defence: the Bible describes things as they appear to human observers (e.g., “sunrise”) without making scientific claims. This defence works for atmospheric or observational descriptions (sunrise, sunset, the shadow on a sundial). However, it **fails** for the structural, material claims of Genesis 1: a solid dome, a cosmic ocean, and windows in the sky. These are **not appearances**; they are physical mechanisms. No one “observes” a solid dome or waters above the sky.

Therefore, the phenomenological defence cannot rescue the inerrancy of Genesis 1 without effectively admitting that the text is making false scientific statements.

This paper does not require any particular theological conclusion. It simply presents the evidence.

Conclusion

The evidence is consistent and extensive. The Hebrew Bible presents the universe as:

- a **flat disc**,
- covered by a **solid dome** (the *rāqīaʿ*),
- with a **cosmic ocean above** and a **cosmic ocean below**.
- The sun, moon, and stars move inside the dome; rain enters through literal windows.
- The earth rests on pillars and foundations and has ends

and corners.

This cosmology is closely analogous to that of Israel's ancient Near Eastern neighbours. It is the plain meaning of the text, confirmed by every standard Hebrew lexicon and by believing scholars such as Walton, Greenwood, Parry, and Seely.

The mountain does not negotiate. Neither does the Hebrew text.

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Free Will as Attractor Autonomy: A Dynamical Account of Agency

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Abstract

Free will is often seen as either a magical mystery (libertarianism) or an illusion (hard determinism). This paper offers a third view using the attractor framework.

In this framework, your mind is a **dissipative, self-referential attractor** of your whole body.

Free will is redefined as **attractor autonomy**:

- The ability to generate behaviour from your own internal dynamics.
- To keep yourself stable over time.
- To model yourself.
- And to reshape your own attractor landscape over time.

Agency comes in degrees – it is not a simple yes/no.

We give a mathematical formula for an **agency index** AA that combines three factors:

- **Attractor dimensionality** DD (complexity of your brain's activity)
- **Recursive self-modification** RR (your ability to change your own habits)
- **Self-reference strength** SS (how well you have a persistent self-model)

The paper makes a **falsifiable prediction**: an **inverted-U** relationship between attractor dimensionality and sense of agency – too low or too high reduces agency.

We describe how to test this with EEG, intentional binding tasks, and statistical methods. We also engage with classic

compatibilist philosophers (Frankfurt, Dennett) and address Pereboom's manipulation argument.

We even provide an explicit rule to avoid the "liver problem" (a false positive for self-reference).

1. Introduction

The attractor framework says that **persistence under disturbance** is the basic mark of reality.

Minds are **dissipative attractors** – patterns that need constant energy flow, integrating the whole body.

In this view, free will cannot be a supernatural break from cause and effect. Instead, it must be a **dynamical property** of certain attractors.

We do not claim to solve the ancient free will debate. We offer a **naturalistic, testable redefinition** that adds new empirical content to compatibilism.

2. What Free Will Is Not – And What It Is

2.1 Rejecting supernatural libertarianism

Libertarian free will requires an uncaused choice – a break in the chain of cause and effect.

The attractor framework rejects this: there is no evidence for it, and it contradicts physical laws.

2.2 The error of hard determinism

Hard determinism says freedom is an illusion because everything is determined. But it confuses “determined” with “externally coerced”.

A system can be **internally determined** – by its own attractor – yet still be free. That is the core of **compatibilism**.

2.3 Free will as attractor autonomy

We define **free will** (or agency) as the degree to which a system has four properties:

1. **Dissipative persistence** – it stays alive by using energy and exporting waste (measured by energy use and recovery speed).
2. **Self-reference** – it has an internal subsystem (an “indexical locus”) that models the whole system and is stable.
3. **Trajectory selection** – it can choose among different possible futures (measured by **policy entropy** $H(\pi)$).
4. **Recursive self-engineering** – it can change its own attractor shape (measured by learning-to-learn or metacognitive accuracy).

These four are **jointly necessary**. If any is missing, agency is at best primitive.

Because they are necessary, we combine them with a **multiplicative** formula (if any factor is zero, agency is zero).

$$A = (D - D_{\min} \div D_{\max} - D_{\min})^{\alpha} (R - R_{\min} \div R_{\max} - R_{\min})^{\beta} (S - S_{\min} \div S_{\max} - S_{\min})^{\gamma}$$
$$A = (D_{\max} \div D_{\min} \div D - D_{\min} \div D_{\min})^{\alpha} (R_{\max} \div R \div R_{\min})^{\beta} (S_{\max} \div S - S_{\min} \div S_{\min})^{\gamma}$$

Where:

- DD = attractor dimensionality (e.g., from EEG)
- RR = recursive modification capacity (e.g., improvement

in a meta-learning task)

- SS = self-reference strength (normalised mutual information)

The constants (D_{min} , D_{max} , D_{min} , D_{max} , etc.) are set from a reference population.

The exponents α, β, γ are estimated from data (e.g., comparing healthy people with patients).

A threshold A_{crit} (e.g., the 5th percentile of healthy humans) decides where agency begins.

Agency is **graded**:

- Rock: $A \approx 0$
- Thermostat: $A \approx 0$
- Worm: $A \approx 0.1$ (some learning, little self-model)
- Human: $A \approx 0.8$

3. The Indexical Locus: Defining the “Self” and Avoiding the “Liver Problem”

The **indexical locus** LL is the part of the system that acts as a persistent self-model.

To avoid trivial cases (like a liver having high mutual information with the rest of the body), we add three extra conditions:

- **Top-down causal influence** – LL can change the rest of the body in ways that serve the body’s goals (measured by variance explained beyond bottom-up effects).
- **Informational closure** – LL ’s own dynamics are relatively

independent of the rest over short timescales (conditional mutual information > 0).

- **Self-referential loop** – LL influences the body, and the body influences LL back (bidirectional Granger causality).

These criteria rule out livers, pacemakers, and simple homeostats. The indexical locus is a **recursive self-model**, not just a predictive subsystem.

4. Active Inference and Policy Entropy

In active inference (Friston), agents try to minimise “free energy” – they pick **policies** (sequences of actions).

Each policy is a trajectory through the agent’s attractor landscape.

Policy entropy $H(\pi) = -\sum p(\pi) \log p(\pi)$ $H(\pi) = -\sum p(\pi) \log p(\pi)$ measures how many different policies are available.

- Low entropy → rigid, one-track mind.
- High entropy → flexible, but possibly noisy.

Free will is the ability to access many low-energy policies. The agent’s choices are not random; they are constrained by the attractor geometry. But if several attractor basins are open, the agent can choose among them – that is what we feel as free choice.

Policy entropy can be measured in behavioural tasks where multiple choices are equally good (e.g., probabilistic reversal learning, two-armed bandit tasks).

5. The Inverted-U Prediction and Falsification

5.1 Core prediction

We predict an **inverted-U** relationship between attractor dimensionality DD and the subjective sense of agency (e.g., from intentional binding experiments).

- Very low DD → chaotic, unstable (like schizophrenia) → low agency.
- Very high DD → rigid, stuck (like OCD) → low agency.
- In the middle → flexible but stable → high agency.

The agency index AA also includes RR and SS , which we think increase agency across the board. So to test the inverted-U for DD alone, you need to **control for** RR and SS (e.g., study people matched on those, or use partial correlation).

5.2 How to measure and test

- **Attractor dimensionality DD** – use the Grassberger-Procaccia algorithm on 5-min resting-state EEG/MEG.
- **Sense of agency** – use the **intentional binding** paradigm: press a key, then a tone sounds; participants estimate the time between action and tone. Stronger binding means higher agency.
- **Statistical test** – fit a quadratic regression: $\text{agency} = \beta_0 + \beta_1 D + \beta_2 D^2$
If $\beta_2 < 0$ and the vertex lies inside the observed range of DD , the inverted-U is supported. Use bootstrap (1000 resamples) to check confidence intervals.

5.3 Falsification condition

The framework is **falsified** if:

- The quadratic coefficient β_2 is not negative (no inverted-U).
- Or, in a clinical experiment (e.g., increasing *DD* in OCD patients with NMDA drugs), agency does **not** decrease but keeps increasing.

6. Experimental Proxies – Summary Table

Construct	Measure	How to record	Expected relation to agency
Attractor dimensionality <i>DD</i>	Correlation dimension (Grassberger-Procaccia)	Resting-state EEG/MEG (5 min)	Inverted-U
Policy entropy $H(\pi)$	Entropy of choice distribution	Probabilistic reversal learning (200 trials)	Inverted-U
Sense of agency	Intentional binding magnitude	Action-outcome interval compression (50 trials)	Max at intermediate <i>DD</i>
Recursive self-modification <i>RR</i>	Learning-to-learn improvement	Meta-learning task (pre-post difference)	Positive (more is better)
Self-reference strength <i>SS</i>	Normalised mutual info $\ln(L;S)/\ln(L;S)$	Resting-state fMRI or MEG	Threshold $> \theta$

7. Hierarchical Constraints and Social Attractors

Free will is **nested** inside larger attractors – society, culture, laws, economy. Your range of choices is partly set by these.

This is not an objection; it is just the fact that freedom is always **constrained autonomy**.

We predict that societies with more cultural diversity (higher “cultural entropy”) allow more individual agency, other things being equal. This can be tested by cross-cultural comparisons of policy entropy in decision tasks.

8. Engagement with Compatibilist Literature

8.1 Standard compatibilists (Frankfurt, Dennett)

- **Frankfurt (1971)**: freedom is about your will aligning with your own desires. Our framework adds that those desires must be encoded in a persistent self-referential attractor. The recursive self-engineering component RR maps directly to Frankfurt’s “second-order volitions”.
- **Dennett (1984)**: freedom is about being able to respond to reasons. Our framework adds that this requires a certain basin geometry and recursive plasticity.

8.2 Addressing Pereboom's manipulation argument

Pereboom argues: if a neuroscientist engineers your brain, you are not free – even if your behaviour comes from internal dynamics.

Our reply: agency requires **recursive self-modification** ($R > 0$) at some point in your history.

- A perfectly manipulated agent that never changed its own attractor would have $R \approx 0$ and thus $A \approx 0$.
- A healthy human who learned and adapted has $R > 0$ and genuine agency.

The origin of the initial attractor does not matter – only the presence of self-modification over time.

9. Open Questions and Limitations

- **Calibrating exponents** – α, β, γ and the threshold θ need to be estimated from large-scale data (e.g., Human Connectome Project) using maximum likelihood.
- **The liver problem** – our exclusion criteria need empirical validation; we must show that organs like the liver do **not** satisfy them.
- **Inverted-U for policy entropy** – the same shape is predicted but may be hidden by decision noise.
- **Moral responsibility** – the framework gives a basis for responsibility (if $A > A_{crit}$), but it does not settle all normative questions – it only gives a scientific starting point.

10. Conclusion

Free will is **not** a supernatural escape from physics. It is a **dynamical property** of certain dissipative, self-referential attractors:

- The ability to act from your own internal dynamics.
- To keep a stable self-model over time.
- And to reshape your own attractor landscape.

This account is compatibilist, testable, and graded.

The inverted-U prediction, with a specified statistical test, gives a clear falsification criterion.

The dance of free will is the dance of a self that persists under perturbation.

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