Pudding Theory: A Topological Theory of Information Fields

A Unified Framework of Spacetime, Information, and Consciousness

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Abstract

The unification of quantum mechanics, general relativity, and consciousness remains a central challenge in modern science. We present Pudding Theory, a Topological Theory of Information Fields. We postulate that the quantum vacuum acts as a stochastic reservoir susceptible to information pressure. We introduce a Hidden Sector complex scalar field Ξ (integrated information) with topological boundary conditions, coupled to the Standard Model via a massive gauge boson, *Lumina* (A_μ), through stochastic resonance with zero-point fluctuations. We construct a gauge-invariant action, demonstrate how weak informational signals ($\sim$20 W) can bias macroscopic probability distributions by modulating the noise threshold of chaotic systems, and place laboratory signatures in the language of effective field theory and open quantum dynamics (completely positive, trace-preserving). Version 3 adds an explicit physical interpretation (the Eddy Picture), reconciles the field's ontology with its neural coarse-graining (condensation, not emergence), states a benchmark falsifiability contract with kill-thresholds, and specifies three platform-scale protocols with cryptographic blinding. The aim is straightforward: either distinctive signals consistent with the framework appear in precision data, or the same analyses tighten bounds and refine the claim about any human-scale laboratory effects.

Keywords: Pudding Theory, consciousness, information topology, Lumina, priors, hidden sector, stochastic resonance, observer effect, effective field theory, Lindblad, negentropy, superradiance

Why This Matters

Pudding Theory treats awareness as a field with lawful dynamics. The formulation avoids superluminal signaling and situates the proposal within effective field theory and open quantum systems, enabling direct confrontation with data. By utilizing stochastic resonance, it solves the "energy mismatch" problem, explaining how the low-energy mind influences high-energy matter without violating thermodynamics. The math is real. The predictions are explicit. The claims are falsifiable. And the epistemic stance is fixed in advance: when the outcome is unclear, we do not call it a success. We call it data.

1 Introduction

Pudding Theory posits three foundational components:

- **Spacetime:** a differentiable manifold with metric $g_{\mu\nu}$, permeated by the zero-point field (ZPF).
- **Information:** all potential configurations, quantified by statistical mechanics and the Fisher information metric.
- **Consciousness field (Ξ):** a fundamental scalar field representing raw awareness.

A mediating process, **Lumina**, organizes interactions between these layers via kinetic mixing.

Field content and consistency. We adopt a complex scalar residing in a hidden sector. To ensure Lorentz invariance, Ξ couples to a $U(1)$ gauge field, Lumina (A_μ). Unlike standard forces, Lumina acts as a *negentropy current*, reducing local disorder. The interaction with visible matter is mediated by the stochastic fluctuations of the vacuum, allowing the observer to "steer" rather than "push" the system.

Epistemic status. We distinguish between established physics (standard quantum field theory, thermodynamics, dynamical systems) and novel postulates introduced by Pudding Theory. The framework is explicitly an effective field theory (EFT) — valid within specified energy scales and approximations, with unknown UV completion.

1.1 The Eddy Picture *(new in v3)*

The framework's physical interpretation is best stated before its mathematics. Picture a river delta. The sand-bed is **spacetime**: it holds shape, channels flow, and is itself slowly reshaped by what moves across it. The still water resting over the bed is the **consciousness substrate** Ξ: present everywhere, undramatic, prior to any event. The forms the sediment can take — every channel that could be cut, every bar that could be deposited — is **information**: the space of possible configurations, which is why we give it a geometric face. And **Lumina** is motion put into the water: the mediating flow that turns still possibility into actual pattern.

A living being, in this picture, is an **eddy** — a locally stable whirl the flow spins up in the water over the bed. Three consequences guide the formal construction:

- **Consciousness is not produced; it is participated in.** The water does not begin to exist where the eddy spins. Formally: the field Ξ is fundamental and defined everywhere; in regions of high complexity it *condenses* — acquires a vacuum expectation value (§4.2) — rather than coming into existence. The coarse-graining construction of §3.2 is a *measurement map* telling us how to read the local condensate off a neural substrate; it is not an ontology claim.
- **The boundary of a person is the eddy, not the skull.** What you can see, touch, and imagine — the experienced surround — participates in the same whirl. The natural coupling region of an agent is the information horizon $\partial\Omega$ within the Lumina range ($\sim$1 m), not the volume of the cortex.
- **Life is the spin.** The interaction of the three layers, driven by Lumina, is what the framework means by lived experience: priors shaping flow, flow updating reality, reality updating priors — the loop closed.

Everything that follows is this picture made precise.

2 Quick Terminology Bridge

Technical term	Narrative / plain-language equivalent
Hidden-sector scalar Ξ	Consciousness substrate; the observer's internal state — the still water of the delta.
Gauge boson A_μ	**Lumina**: the force of intent/negentropy — motion put into the water.
Topological boundary $\partial\Omega$	**Information horizon**: the local region where the observer can influence probability — the eddy's edge.
Ginzburg–Landau potential $V(\Xi)$	Priors/beliefs: the shape of the observer's expectation.
High Lyapunov exponent	Unstable systems: susceptible to bias.
Low Lyapunov exponent	Stable systems: resistant to bias.
Lindblad operator $L[\rho]$	Decoherence dynamics: how observation selects outcomes.
Topological charge Q	Prior stability: how beliefs resist perturbation.
Experience field $\mathcal{V}(x)$	Subjective reality: the "what it is like" at the triple intersection.
Overlap of many observers' fields	**Pudding storm**: coherent collective amplification — eddies merging into one whirl.

3 Fundamental Concepts

3.1 Spacetime and the ZPF

Spacetime carries metric $g_{\mu\nu}$. The vacuum is not empty but filled with stochastic zero-point fluctuations $\eta(x)$. In Pudding Theory, these fluctuations are the carrier wave for information.

> **Definition 3.1** (Zero-Point Field). The ZPF is characterized by spectral density
>
> $$S_\eta(\omega) = \frac{\hbar\omega}{2}\coth\left(\frac{\hbar\omega}{2k_BT}\right). \tag{1}$$
>
> At zero temperature this reduces to $S_\eta(\omega) = \hbar\omega/2$, representing irreducible quantum noise.

3.2 The Consciousness Field: Rigorous Definition

> **Postulate 3.1** (Consciousness Field Condensation — *revised in v3*). The consciousness field $\Xi(x)$ is fundamental. In complex substrates (neural or otherwise) it condenses: the local field configuration is *organized and read out* via a coarse-graining of the substrate's microscopic integrated information. Coarse-graining supplies the measurement map from substrate to field; it does not create the field.

We define the observer not as a biological object, but as a region of non-zero integrated information (Φ). The mapping to a continuous field:

> **Definition 3.2** (Coarse-Grained Information Field). Let M be a complex system with discrete integrated information Φ_i at nodes i. The continuous field is obtained via
>
> $$\Xi(x) = \sum_i \Phi_i\, K_\sigma(x - x_i)\, e^{iS_i}, \tag{2}$$
>
> where K_σ is a Gaussian smoothing kernel with characteristic length σ (approximately the neural correlation length, $\sim$1 mm) and S_i is the local prior (belief state) at node i.

The magnitude and phase decompose as $\Xi(x) = \sqrt{\Phi(x)}\, e^{iS(x)}$, where $|\Xi|^2 = \Phi(x)$ is the local information density ("consciousness intensity") and $S(x) = \arg(\Xi)$ is the local prior field ("belief configuration").

What makes a system an efficient participant. The Fisher–Rao kinetic density of the prior field, $\rho_\theta \equiv G_{ij}(\theta)\,\partial_\mu\theta^i\partial^\mu\theta^j$, is large exactly where expectations are dense, structured, and rapidly updating. By the free-energy principle [7], a brain is precisely a physical device for maintaining high, organized ρ_θ — an adaptive receiver minimizing prediction error on its statistical manifold. High-ρ_θ regions sustain the condensate (the eddy); low-ρ_θ regions (rocks, walls) are still water. Nothing in ρ_θ refers to neurons: any system that maintains dense, self-updating priors — biological or otherwise — participates. This is a prediction, not an oversight (cf. Open Question 5).

3.3 Why Gauge Symmetry? Information Conservation

> **Postulate 3.2** (Information Conservation Symmetry). The total integrated information within a closed system is conserved under unitary evolution. This conservation law implies a $U(1)$ gauge symmetry via Noether's theorem.

The gauge transformation $\Xi \to e^{i\alpha(x)}\Xi,\ A_\mu \to A_\mu + \frac{1}{g}\partial_\mu\alpha$ leaves the action invariant. The conserved current is

$$J_I^\mu = i(\Xi^*\partial^\mu\Xi - \Xi\,\partial^\mu\Xi^*) - 2g|\Xi|^2A^\mu \tag{3}$$

— the *information current*: the flux of integrated information through spacetime.

3.4 Lumina (The Gauge Field)

Lumina is the Abelian gauge field A_μ associated with the conservation of information, arising from the symmetry breaking of Ξ. It represents the flux of order (negentropy) from the observer into the environment, with field strength $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$. The Lumina flux through a surface Σ, $\Phi_L = \int_\Sigma F_{0i}\,d\Sigma^i$, quantifies the rate at which the observer is "radiating intent."

3.5 System Stability (Lyapunov)

The susceptibility of a system to Lumina is governed by its stability. Chaotic systems (positive Lyapunov exponents) amplify microscopic informational biases into macroscopic shifts; stable systems damp the signal.

> **Definition 3.4** (Lyapunov Susceptibility). For a dynamical system with maximal Lyapunov exponent $\lambda_{\max}$,
>
> $$\chi(\lambda_{\max}) = \begin{cases} e^{\lambda_{\max}\tau} & \lambda_{\max} > 0 \text{ (chaotic)} \\ e^{-|\lambda_{\max}|\tau} & \lambda_{\max} < 0 \text{ (stable)} \end{cases} \tag{4}$$
>
> where τ is the characteristic observation time.

3.6 The Experience Field: Triple Intersection

> **Definition 3.5** (Experience Composite Field). The experience field $\mathcal{V}(x)$ is the composite operator arising from the triple coupling
>
> $$\mathcal{V}(x) = |\Xi(x)|^2 \cdot g_{\mu\nu}(x)\,\eta^\mu(x)\eta^\nu(x) \cdot e^{iS(x)}. \tag{5}$$
>
> It is non-zero only where all three sectors overlap: consciousness present ($|\Xi| > 0$), spacetime fluctuations exist ($\eta \neq 0$), and informational structure is defined (S well-posed).

> **Proposition 3.1** (Subjective Inaccessibility). $\mathcal{V}(x)$ is first-person observable but third-person inaccessible. External measurements can detect $|\Xi|^2$, $g_{\mu\nu}$, and statistical signatures of S, but cannot access $\mathcal{V}(x)$ directly.

This formalizes the intuition that "you experience the update" but it cannot be directly seen from outside. The experience field is where the reality update is felt — the Lumina-mediated collapse rendered as qualia.

4 Mathematical Framework

4.1 The Hidden Sector Action

To satisfy Lorentz invariance and avoid QFT anomalies, we model the system as a hidden sector coupled to the Standard Model via kinetic mixing [2]:

$$S = \int d^4x\sqrt{-g}\,\Big[\mathcal{L}_{\rm SM} - \frac{1}{4}F'_{\mu\nu}F'^{\mu\nu} + |D_\mu\Xi|^2 - V(\Xi) + \mathcal{L}_{\rm mix} + \mathcal{L}_{\rm top}\Big], \tag{6}$$

with $D_\mu = \partial_\mu - igA_\mu$. In the gravitational sector the metric obeys the Einstein equations sourced by all sectors, $G_{\mu\nu} = \frac{8\pi G}{c^4}(T^{\Xi}_{\mu\nu} + T^{A}_{\mu\nu} + T^{\rm SM}_{\mu\nu})$; a non-minimal curvature coupling $\xi|\Xi|^2R$ is admissible and yields minute, secondarily testable gravitational shifts (v1, §4.3).

4.2 The Potential and Symmetry Breaking

$$V(\Xi) = -\mu^2|\Xi|^2 + \lambda|\Xi|^4. \tag{7}$$

In regions of high complexity (brains), the field acquires a non-zero vacuum expectation value $\langle\Xi\rangle = v = \sqrt{\mu^2/2\lambda}$, giving the Lumina boson a mass $m_A = gv$ and confining the range of the force to

$$r_L = \frac{\hbar}{m_A c} \approx \frac{1}{gv}. \tag{8}$$

For effects confined to the vicinity of the observer ($\sim$ meters), we estimate $m_A \sim 10^{-7}$ eV. This is the condensation of §1.1: the field exists everywhere; the eddy is where it condenses.

4.3 Topological Structure: Priors as Winding Numbers

> **Postulate 4.1** (Topological Protection of Beliefs). The prior field $S(x)$ admits topologically non-trivial configurations characterized by a winding number
>
> $$Q = \frac{1}{2\pi}\oint_{\partial\Omega} \nabla S \cdot d\ell \;\in\; \mathbb{Z}, \tag{9}$$
>
> quantifying the "strength" of a belief and providing topological stability against small perturbations.

The action includes a topological contribution $\mathcal{L}_{\rm top} = \frac{\theta}{8\pi^2}F_{\mu\nu}\tilde{F}^{\mu\nu}$, where $\tilde{F}^{\mu\nu} = \frac{1}{2}\epsilon^{\mu\nu\rho\sigma}F_{\rho\sigma}$. The parameter θ couples to the topological charge, allowing the prior configuration to influence vacuum structure. This explains why strongly-held beliefs (high $|Q|$) are resistant to contrary evidence: they occupy topologically protected minima.

4.4 The Stochastic Resonance Mechanism

Classical stochastic resonance requires a periodic signal. We generalize to *noise-assisted threshold crossing* (NATC), which applies to aperiodic signals. For a system with potential barrier ΔU and noise intensity D, the Kramers escape rate [13] is

$$r_K = \frac{\omega_0\,\omega_b}{2\pi\gamma}\exp\Big(-\frac{\Delta U}{D}\Big). \tag{10}$$

> **Proposition 4.1** (Lumina-Modified Barrier). The consciousness field modifies the effective barrier height:
>
> $$\Delta U_{\rm eff} = \Delta U - \epsilon\,|\Xi|^2\cos(S - S_{\rm target}), \tag{11}$$
>
> where $S_{\rm target}$ is the phase corresponding to the intended outcome and ϵ the coupling strength.

This is the key mechanism: Lumina does not supply energy to cross the barrier. It **selectively lowers the barrier for preferred outcomes**, allowing pre-existing ZPF fluctuations to push the system over. The modified escape rate is

$$r'_K = r_K \cdot \exp\Big(\frac{\epsilon|\Xi|^2\cos(\Delta S)}{D}\Big). \quad (12)$$

For alignment ($\Delta S = 0$) the rate increases exponentially; for misalignment ($\Delta S = \pi$) it decreases.

4.5 Lindblad Dynamics: Observer-Biased Decoherence

The density matrix ρ of a quantum system coupled to an observer evolves as

$$\frac{d\rho}{dt} = -\frac{i}{\hbar}[H, \rho] + \sum_k \gamma_k \Big(L_k \rho L_k^\dagger - \frac{1}{2}\{L_k^\dagger L_k, \rho\}\Big). \quad (13)$$

> **Postulate 4.2** (Consciousness-Biased Decoherence). In the presence of a consciousness field, decoherence rates acquire a directional bias $\gamma_k \to \gamma_k^{(0)} + \delta\gamma_k(\Xi)$ with
>
> $$\delta\gamma_k(\Xi) = \kappa\,|\Xi|^2\,|\langle\psi_k|S\rangle|^2, \quad (14)$$
>
> where $|\psi_k\rangle$ is the pointer state of channel k and $|S\rangle$ the state corresponding to the observer's prior.

The observer does not collapse the wavefunction to an arbitrary state. Decoherence preferentially funnels the system toward states aligned with the prior [11]. This is **selection, not creation** — and because the dynamics remain completely positive and trace-preserving, the framework never needs the nonlinear Schrödinger evolutions that generate signaling paradoxes [15, 16].

4.6 Energy Conservation: The Selection Principle

> **Theorem 4.1** (No Energy Injection). The Lumina-mediated bias does not inject energy into the target system; it biases selection among energetically degenerate (or near-degenerate) fluctuations.

Argument. The ZPF provides a continuous spectrum of fluctuations at all frequencies. The observer-coupled Lindblad dynamics selects which fluctuations are amplified by altering branching ratios, not by adding energy. In the total budget $E_{\text{total}} = E_{\text{system}} + E_{\text{ZPF}} + E_{\text{observer}}$, the observer expends metabolic energy ($\sim$20 W) to maintain the coherent Ξ field — this energy goes into maintaining low entropy in the brain [6], not into the target system. The target's energy changes come from the ZPF reservoir, which has effectively infinite capacity at relevant scales.

4.7 Coupling Constant Estimation from PEAR Data

The Princeton Engineering Anomalies Research (PEAR) laboratory reported consistent small deviations in random number generator outputs correlated with operator intention [8, 9]. The meta-analytic effect size is $z \approx 0.0003$ per bit — a probability shift to $p \approx 0.50015$ from the null $p = 0.5$.

> **Proposition 4.2** (Coupling Constant Estimate). From the PEAR effect size,
>
> $$\epsilon_{\text{eff}} = \frac{\delta p}{\sqrt{\Phi}\cdot\chi(\lambda_{\max})}. \quad (15)$$
>
> For a human observer with $\Phi \sim 10^{10}$ bits (rough IIT estimate) and an RNG with $\lambda_{\max}\tau \sim 1$: $\epsilon_{\text{eff}} \sim 10^{-8}$ to 10^{-9}, consistent with hidden-sector mixing parameters $\epsilon \sim 10^{-4}$ suppressed by additional geometric factors.

Falsifiability contract *(new in v3)*. We do not here adjudicate the PEAR/GCP claims — the critiques (optional stopping, selection, publication effects) are serious, and the protocols of §8 exist precisely to defeat them. We use the number as the *scale a real effect would have to have*, and we pin the framework to it: (i) if pre-registered, blinded, adequately powered RNG protocols with a directed observer inside r_L repeatedly bound $\delta p < 10^{-6}$, the benchmark point is excluded and the human-scale claim must retreat or be abandoned; (ii) if effect sizes fail to order by the target's Lyapunov exponent (§5.3), the susceptibility mechanism is falsified; (iii) if group protocols scale as N rather than N^2 under verified phase alignment, the superradiance mechanism is falsified. Either outcome is progress; all are publishable.

5 Implications

5.1 Unification of Physics and Consciousness

The complex scalar and vector furnish a lawful interface for awareness variables to influence effective potentials without violating causality or energy conservation.

5.2 Probability Tunneling

An anomalous event is mathematically a *probability tunneling* event. High-density Ξ creates a standing wave in the A_μ field; through resonance with the ZPF, this wave biases random fluctuations, making a statistically unlikely event inevitable over sufficient attempts:

$$\Gamma_{\text{tunnel}} = \Gamma_0 \exp\left(\frac{\epsilon|\Xi|^2\chi(\lambda_{\max})}{D}\right). \tag{16}$$

Events with $\Gamma_0 \sim 10^{-6}$ can become $\Gamma_{\text{tunnel}} \sim 10^{-2}$ under strong coherent intention in chaotic systems.

5.3 Macroscopic Susceptibility

The mathematics explains why observers can influence fluid or chaotic dynamics but not static solids — the framework's built-in answer to "why can't you bend spoons?":

System	**$\lambda_{\max}$ (s^{-1})**	**Susceptibility χ (τ = 1 s)**
Rigid solid	< 0	~ 0
Viscous fluid	$0.01 - 0.1$	$1.01 - 1.1$
Turbulent flow	$0.1 - 1$	$1.1 - 2.7$
Crowd dynamics	$0.5 - 2$	$1.6 - 7.4$
RNG (electronic noise)	$1 - 10$	$2.7 - 10^4$
Stock market	$0.1 - 0.5$	$1.1 - 1.6$

5.4 Neuroscience and Mind

The priors field (phase of Ξ) implements predictive processing in field form: the brain acts as an adaptive receiver minimizing a free-energy functional on its Fisher–Rao manifold [7, 12]. The quantity neuroscience says the brain optimizes is the quantity the theory says sustains the condensate (§3.2).

5.5 Group Coherence Effects

PROPOSITION 5.1 (Superradiance Analogy). When N observers align their prior phases, the total field adds coherently:

$$|\Xi_{\text{total}}|^2 = \Big|\sum_{i=1}^{N} \Xi_i\Big|^2 = N^2|\Xi_0|^2 \text{ (coherent)} \qquad \text{vs.} \qquad N|\Xi_0|^2 \text{ (incoherent)}. \tag{17}$$

Coherent groups have N-fold enhancement over incoherent aggregation, analogous to Dicke superradiance [14]. This provides a mechanism for collective intention effects; shared priors occupy neighboring points of the Fisher–Rao manifold, supplying the phase alignment. Ritual, chant, and synchronized attention are, in this reading, phase-locking technologies.

5.6 Temporal Considerations: Block Universe and Selection

POSTULATE 5.1 (Retrocausal Selection). In the block universe, the observer's prior at time t_1 (observation) can constrain the decoherence branching structure at time $t_0 < t_1$ (generation), provided the system remains in superposition until t_1.

This is not retrocausal signaling — no information travels backward. It is a boundary condition: the observer at t_1 is part of the consistent history that selected the outcome at t_0, analogous to the delayed-choice quantum eraser and formalizable in two-time frameworks such as the two-state-vector formalism [17].

6 Derived Principles

The framework yields ten operational principles — corollaries of the formalism, not independent axioms. Each is listed with its formal basis and its *confidence tier* (v3): **strong** = direct consequence of the action; **moderate** = requires a stated auxiliary condition; **developing** = mechanism identified, quantitative treatment open.

1. **Signal Dominance** *(strong)*. Observers exist on a continuous spectrum of integrated-information density. Higher Φ generates stronger Lumina fields and proportionally greater bias. At the low-density limit, observers primarily receive consensus reality; at the high-density limit, they actively transmit probability configurations. *Basis:* $|A_\mu| \propto |\Xi|^2$; $\Delta U_{\text{eff}} \propto \epsilon|\Xi|^2$.
2. **Material Memory** *(developing)*. Objects in prolonged contact with high-Φ observers accumulate standing-wave patterns in the Lumina field, persisting due to low Lyapunov exponents — localized probability wells storing prior configurations. *Basis:* conservation of topological charge Q; stable systems resist decay of informational imprints. *Open:* the imprint-relaxation time has not been computed; treat object-memory experiments as exploratory until it is.
3. **Vacuum Receptivity** *(strong)*. The quantum vacuum is a stochastic reservoir carrying informational modulation; zero-point fluctuations are the carrier wave. *Basis:* Langevin coupling of observer signal to $\eta(t)$.
4. **Chaos Susceptibility** *(strong)*. Systems with positive Lyapunov exponents amplify microscopic biases into macroscopic outcomes; unstable systems respond, stable systems resist. *Basis:* $\chi = e^{\lambda_{\max}\tau}$; Table in §5.3.
5. **Observer as Field** *(strong)*. The observer is a spatially extended region of integrated information, not a point: $\Xi(x)$ defines the boundary, $S(x)$ encodes beliefs. *Basis:* Eq. (2); the eddy of §1.1.
6. **Intent as Negentropy** *(strong)*. Focused intention generates coherent Lumina flux — a negentropy current organizing stochastic fluctuations into ordered outcomes. *Basis:* $U(1)$ information current J_I^μ.
7. **Temporal Softening** *(moderate)*. Rigid barriers become increasingly susceptible over extended timescales as fluctuations accumulate. *Basis:* time-integrated noise in the Kramers rate; τ-dependence of

χ.

8. **Proximity Gradient** *(strong)*. Observer effects decay as e^{-r/r_L} with $r_L = \hbar/m_A c \sim 1$ m. *Basis:* massive-mediator Yukawa confinement — proximity is not a postulate; it is what a massive gauge boson does.
9. **Retrocausal Selection** *(developing)*. Observer priors at measurement constrain the branching structure of earlier stochastic events — selection within a consistent history, not signaling. *Basis:* Postulate 5.1. *Open:* a two-time sector with checked consistency conditions; until then, log retro-protocol results (e.g. Mind Lottery) as exploratory data.
10. **Coherent Amplification** *(moderate)*. N phase-aligned observers scale as N^2; incoherent groups as N. *Basis:* Proposition 5.1, given shared-prior phase-locking. Directly testable as a scaling exponent (§8).

6.1 Ethical Considerations

Principle 1 (Signal Dominance) predicts differential reality-shaping capacity among observers. This requires explicit clarification:

- The spectrum of Φ density does **not** imply differential moral worth, consciousness quality, or human value.
- All observers experience the composite field $\mathcal{V}(x)$. The distinction is functional (transmit vs. receive bias), not ontological (real vs. unreal).
- Low-Φ states may be temporary, contextual, or developmental. The theory does not posit fixed categories of persons.
- The capacity to influence probability distributions is orthogonal to virtue, wisdom, or ethical standing.

Any interpretation of this framework that assigns differential human dignity based on Φ estimates is a misapplication of the theory.

7 Testable Predictions

- **RNG deviation spectrum:** under focused intention at frequency f, the power spectrum of RNG deviations shows enhancement at f, distinguishing signal from broadband noise.
- **Lyapunov scaling:** effect sizes correlate with the measured Lyapunov exponent of the target. High-chaos systems (turbulent flows, RNGs) show larger effects than low-chaos systems (crystals, rigid bodies).
- **Distance decay:** effect magnitude decays as e^{-r/r_L}; testable via RNG networks at varying distances from the operator.
- **Group scaling:** for N coherent operators, effect size scales as N^2, not N; testable via group protocols with phase-alignment verification.
- **Topological persistence:** strongly-held beliefs (high $|Q|$) resist contrary evidence in proportion to $|Q|$; testable via belief-updating experiments.
- **Object memory:** intention-imprinted objects bias subsequent RNG runs in blind protocols (exploratory tier; see Principle 2).
- **Interferometry and optomechanics (from v1):** additional dephasing Γ_{Pud} in matter-wave interferometry and excess momentum diffusion in mechanical oscillators, determined by Pudding-sector correlators; any null translates directly into bounds via the CSL mapping (Appendix D) [18, 19]. The decisive variant places a directed observer inside r_L under blinded scheduling — a configuration no published experiment has run.

- **Strict nulls for human presence:** any claimed human-dependent effect must survive blinded analysis isolating cognitive tasks from instruments.

8 Platform-Scale Protocols *(new in v3)*

Tabletop physics tests the field sector; the participatory sector is best tested where observers already are. The Book of Houses platform operates three standing protocols, designed so that a null is data:

- **The warp protocol (self-blinded, closed-set).** One real target is drawn by CSPRNG from a user's own pool and sealed among $N-1$ decoys behind commitment hashes; the user works the intention protocol blind, logs pre-scheduled observation windows, scores all N targets for movement *before* unmasking, and only then learns which was real. The statistic is the rank distribution of real targets against the uniform null (mean rank $(N+1)/2$). Commitment hashes make retro-fitting impossible; pre-registered windows kill optional stopping.
- **The collective (N^2) protocol.** Scheduled group sessions direct a House at a common hardware-RNG target during pre-registered windows interleaved with matched controls; the regression of effect size on N separates coherent ($\propto N^2$) from incoherent ($\propto N$) and null models. No historical program could vary N systematically at scale; a platform of Houses can.
- **The prediction-engine calibration.** The platform's goal engine records prior structure, sharing behavior, and outcomes longitudinally. The framework predicts its resonance factors carry information about outcomes beyond mundane covariates; a standing calibration analysis tests exactly that, on data gathered anyway.

All three inherit the paper's epistemic contract: analysis plans pre-registered, blinding structural (cryptographic where possible), and nulls published as bounds.

9 Theoretical Constraints

1. **Renormalization:** a cutoff scale Λ_{cut} below the Planck mass avoids UV divergences; the theory is not UV-complete. Higher-derivative operators must satisfy positivity bounds from analyticity/unitarity, blocking superluminal modes [20].
2. **Energy scale:** Landauer's principle [6] justifies the metabolic cost of information processing; the selection mechanism avoids energy injection into targets.
3. **Standard Model compatibility:** a hidden sector with weak mixing $\epsilon \sim 10^{-4}$ avoids conflict with LHC bounds on dark photons; $m_A \sim 10^{-7}$ eV sits in the ultra-light regime, evading direct detection while allowing macroscopic effects.
4. **No superluminal signaling:** the Lindblad dynamics respect causality; selection occurs locally, correlations appear in post-selected ensembles. Nonlinear Schrödinger alternatives are excluded on Gisin–Polchinski grounds [15, 16].
5. **Thermodynamic consistency:** the second law is satisfied when the observer's entropy production is included.

10 Open Questions

1. **UV completion:** what is the fundamental theory at high energies? Does Ξ emerge from a more basic structure (strings, loops, information)?
2. **Hard problem:** the theory gives the dynamics of consciousness fields, not why there is subjective experience. The explanatory gap remains; Proposition 3.1 locates it precisely at $\mathcal{V}(x)$.

3. **Measurement problem:** does Lindblad-biased decoherence fully resolve it, or relocate it to the observer-definition problem?
4. **Free will:** if priors $S(x)$ determine intention, what determines the priors?
5. **Non-human observers:** what is the threshold Φ for observer status? Do animals, AIs, or collective systems generate Lumina? (The ρ_θ construction of §3.2 is substrate-independent by design; this is a prediction awaiting test.)

11 Conclusion

Pudding Theory offers a mathematically consistent extension to quantum mechanics. By treating information as a physical gauge field and utilizing noise-assisted threshold crossing, we explain how the subjective mind biases objective probability — participation in a substrate that is already everywhere, steering fluctuations that already exist, within a range set by a mass, at a strength set by coherence, along an ordering set by chaos. The universe is not a static clockwork; it is a stochastic system that yields to informational shear. We are the shear. We are not asking for belief. We are asking for experimentation.

Appendix A: Derivation of the Coarse-Grained Field

Starting from a discrete lattice of information-processing nodes with integrated information Φ_i and phases S_i : define $\Xi_{\text{discrete}} = \sum_i \sqrt{\Phi_i}\, e^{iS_i}\delta^{(3)}(x - x_i)$ and apply Gaussian smoothing,

$$\Xi(x) = \int d^3y\, K_\sigma(x-y)\,\Xi_{\text{discrete}}(y) = \sum_i \sqrt{\Phi_i}\, e^{iS_i} K_\sigma(x - x_i), \qquad K_\sigma(r) = \frac{e^{-r^2/2\sigma^2}}{(2\pi\sigma^2)^{3/2}}. \tag{A1}$$

For neural systems $\sigma \sim 1$ mm (correlation length of neural activity), with Φ_i computed via IIT for local circuits [4].

Appendix B: Lindblad Operator Construction

$$L_k = \sqrt{\gamma_k^{(0)} + \kappa|\Xi|^2|\langle\psi_k|S\rangle|^2}\; |\psi_k\rangle\langle\psi_k|, \qquad |S\rangle = \sum_k c_k(S)\,|\psi_k\rangle, \tag{B1}$$

where $|\psi_k\rangle$ are pointer-basis states (eigenstates of the interaction Hamiltonian with the environment) and the coefficients c_k are determined by the Fourier decomposition of the prior field over the relevant spatial region.

Appendix C: Parameter Estimates

Parameter	**Symbol**	**Estimated value**
Lumina mass	m_A	$\sim 10^{-7}$ eV
Lumina range	r_L	~ 1 m
Kinetic mixing	ϵ	$\sim 10^{-4}$
Effective coupling	ϵ_{eff}	$\sim 10^{-8}$
Human Φ	—	$\sim 10^{10}$ bits
Neural correlation length	σ	~ 1 mm
VEV in brain	v	$\sim 10^5$ (information units)

These estimates are order-of-magnitude and require experimental calibration.

Appendix D: Mapping to CSL Language *(from v1)*

For white noise with rate λ and correlation length r_c, the momentum diffusion of a rigid body scales as $D_{pp} \propto \lambda f(r_c)$. The Pudding sector reproduces this with appropriate choices of $S_{FF}^{\rm Pud}(\omega)$ and spatial correlator C_ℓ, allowing direct translation between collapse-model bounds [18, 19] and Pudding parameters. Assuming stationary Gaussian noise, $\langle A_\mu(x)A_\nu(x')\rangle = \int \frac{d\omega}{2\pi} S_{\mu\nu}(\omega)\, e^{-i\omega(t-t')} C_\ell(|\mathbf{x}-\mathbf{x}'|)$, the induced interferometric phase noise is $\Gamma_{\rm Pud} = \frac{1}{\hbar^2}\int \frac{d\omega}{2\pi} S_\Phi(\omega)\,|\tilde{f}(\omega)|^2$, whose observer-conditioned part carries the prefactor $\propto |\Xi|^4 e^{-2r/r_L}$ — the quantity the §7 experiments bound.

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Version 3 (July 2026) merges the September 2025 Unified Framework and January 2026 Topological Theory lineages. From Jan 2026: hidden-sector action, ZPF carrier, IIT coarse-graining, winding-number priors, NATC/Kramers mechanism, biased-Lindblad postulate, energy-conservation theorem, PEAR coupling estimate, ten Derived Principles with Ethics, theoretical constraints, open questions. From Sept 2025: gravitational sector note, CSL mapping (App. D), interferometry/optomechanics predictions, Gisin–Polchinski exclusion, positivity constraints. New in v3: Eddy Picture (§1.1); Postulate 3.1 reframed from *emergence to condensation with ρ_θ participation criterion (§3.2); falsifiability contract with kill-thresholds (§4.7); confidence tiers on the ten principles (§6); platform-scale protocols (§8).*