Pudding Theory: A Topological Theory of Information Fields

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September 10, 2025

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), which possesses topological boundary conditions. This field couples 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 and demonstrate how weak informational signals (~ 20W) can bias macroscopic probability distributions by modulating the noise threshold of chaotic systems. The aim is straightforward: to provide a rigorous mathematical basis for observer-dependent reality rendering.

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

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, 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.

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.

2 Quick Terminology Bridge

Technical Term	Narrative / Plain-Language Equivalent
Hidden Sector Scalar Ξ	Consciousness substrate. The observer's internal state.
Gauge Boson A_μ	Lumina. The force of intent/negentropy.
Topological Boundary $\partial\Omega$	Information Horizon. The local area where the observer can influence probability.
Ginzburg-Landau Potential $V(\Xi)$	Priors/Beliefs. The shape of the observer's expectation.
High Lyapunov Exponent	Unstable Systems. Systems susceptible to bias.
Low Lyapunov Exponent	Stable Systems. Systems resistant to bias.
Lindblad Operator $\mathcal{L}[\rho]$	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.

3 Fundamental Concepts

3.1 Spacetime and 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 $S_\eta(\omega) = \frac{\hbar\omega}{2}$, representing irreducible quantum noise.

3.2 The Consciousness Field: Rigorous Definition

Postulate 3.1 (Consciousness Field Emergence)**.** *The consciousness field $\Xi(x)$ emerges from a* ***coarse-graining*** *procedure applied to the microscopic integrated information of neural or complex substrates.*

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 proceeds as follows:

Definition 3.2 (Coarse-Grained Information Field)**.** *Let $\mathcal{M}$ be a complex system (e.g., neural network) with discrete integrated information Φ_i at nodes i. The continuous field is obtained via:*

$$\Xi(x) = \sum_i \Phi_i \cdot K_\sigma(x - x_i) \cdot e^{i\mathcal{S}_i} \tag{2}$$

where $K_\sigma(x)$ is a Gaussian smoothing kernel with characteristic length σ (approximately the neural correlation length, ~ 1 mm), and $\mathcal{S}_i$ is the local prior (belief state) at node i.

The magnitude and phase decompose as:

$$\Xi(x) = \sqrt{\Phi(x)} e^{i\mathcal{S}(x)} \tag{3}$$

where:

- $|\Xi|^2 = \Phi(x)$: The local information density ("consciousness intensity")
- $\mathcal{S}(x) = \arg(\Xi)$: The local prior field ("belief configuration")

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:

$$\Xi(x) \to e^{i\alpha(x)}\Xi(x), \qquad A_\mu \to A_\mu + \frac{1}{g}\partial_\mu \alpha \tag{4}$$

leaves the action invariant. The conserved current is:

$$J^\mu_{\mathcal{I}} = i(\Xi^* \partial^\mu \Xi - \Xi \partial^\mu \Xi^*) - 2g|\Xi|^2 A^\mu \tag{5}$$

This is 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. It arises from the symmetry breaking of Ξ. It represents the flux of order (Negentropy) from the observer into the environment.

Definition 3.3 (Lumina Field Strength)**.**

$$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu \tag{6}$$

The "Lumina flux" through a surface Σ is:

$$\Phi_L = \int_\Sigma F_{0i}\, d\Sigma^i \tag{7}$$

This 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 (negative exponents) damp the signal, resisting observer influence.

Definition 3.4 (Lyapunov Susceptibility)**.** *For a dynamical system with maximal Lyapunov exponent λ_{max}, we define the **susceptibility** to Lumina as:*

$$\chi(\lambda_{max}) = \begin{cases} e^{\lambda_{max}\tau} & \lambda_{max} > 0 \quad \textit{(chaotic)} \\ e^{-|\lambda_{max}|\tau} & \lambda_{max} < 0 \quad \textit{(stable)} \end{cases} \tag{8}$$

where τ is the characteristic observation time. This quantifies the amplification factor for small perturbations.

3.6 The Experience Field: Triple Intersection

The three foundational components—Consciousness (Ξ), Spacetime ($g_{\mu\nu}$, η), and Information ($\mathcal{S}$)—do not exist in isolation. Subjective experience emerges at their intersection, mediated by Lumina (see Figure 1).

Definition 3.5 (Experience Composite Field)**.** *The **Experience Field** $\mathcal{V}(x)$ is defined as the composite operator arising from the triple coupling:*

$$\mathcal{V}(x) = |\Xi(x)|^2 \cdot g_{\mu\nu}(x)\eta^\mu(x)\eta^\nu(x) \cdot e^{i\mathcal{S}(x)} \tag{9}$$

This field is non-zero only where all three sectors overlap: consciousness is present ($|\Xi| > 0$), spacetime fluctuations exist ($\eta \neq 0$), and informational structure is defined ($\mathcal{S}$ is well-posed).

Proposition 3.1 (Subjective Inaccessibility)**.** *The Experience Field $\mathcal{V}(x)$ is **first-person observable** but **third-person inaccessible**. External measurements can detect $|\Xi|^2$, $g_{\mu\nu}$, and statistical signatures of $\mathcal{S}$, 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.

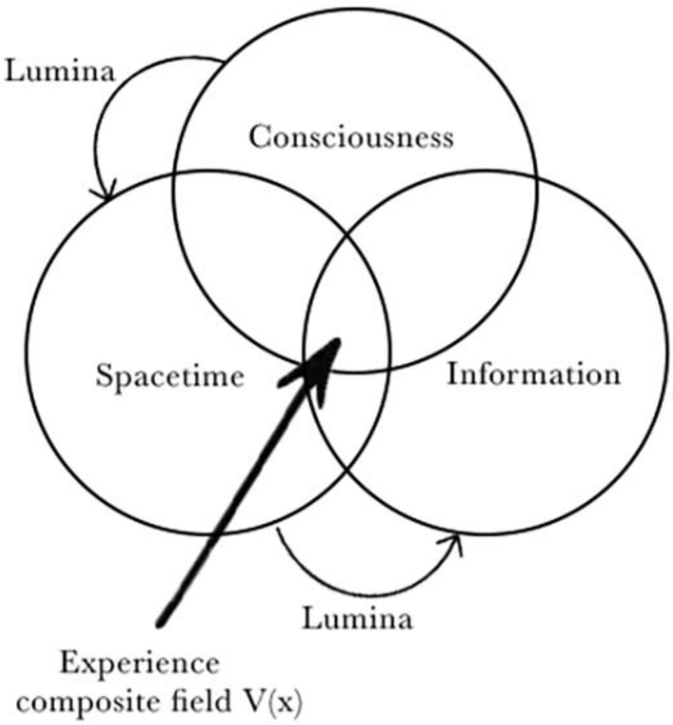

Figure 1: The ontological structure of Pudding Theory. Experience emerges at the triple intersection of Consciousness, Spacetime, and Information, with Lumina mediating the coupling. The Experience Field $\mathcal{V}(x)$ is observable only from within—it constitutes the "what it is like" of being an observer.

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.

$$S = \int d^4x\sqrt{-g}\left[\mathcal{L}_{SM} - \frac{1}{4}F'_{\mu\nu}F'^{\mu\nu} + |D_\mu\Xi|^2 - V(\Xi) + \mathcal{L}_{mix} + \mathcal{L}_{top}\right] \tag{10}$$

where $D_\mu = \partial_\mu - igA_\mu$.

4.2 The Potential and Symmetry Breaking

$$V(\Xi) = -\mu^2|\Xi|^2 + \lambda|\Xi|^4 \tag{11}$$

This potential implies that in regions of high complexity (brains), the field acquires a non-zero vacuum expectation value (VEV):

$$\langle \Xi \rangle = v = \sqrt{\frac{\mu^2}{2\lambda}} \tag{12}$$

giving the Lumina boson a mass $m_A = gv$. This confines the range of the force to:

$$r_L = \frac{\hbar}{m_A c} \approx \frac{1}{gv} \tag{13}$$

For effects confined to the "vicinity" of the observer ($\sim$ meters), we estimate $m_A \sim 10^{-7}$ eV.

4.3 Topological Structure: Priors as Winding Numbers

Postulate 4.1 (Topological Protection of Beliefs)**.** *The prior field $\mathcal{S}(x)$ admits topologically non-trivial configurations characterized by a winding number:*

$$Q = \frac{1}{2\pi} \oint_{\partial\Omega} \nabla \mathcal{S} \cdot d\boldsymbol{\ell} \tag{14}$$

This integer $Q \in \mathbb{Z}$ quantifies the "strength" of a belief and provides topological stability against small perturbations.

Definition 4.1 (Topological Term)**.** *The action includes a topological contribution:*

$$\mathcal{L}_{top} = \frac{\theta}{8\pi^2} F_{\mu\nu} \tilde{F}^{\mu\nu} \tag{15}$$

where $\tilde{F}^{\mu\nu} = \frac{1}{2}\epsilon^{\mu\nu\rho\sigma} F_{\rho\sigma}$ is the dual field strength. 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: Refined Treatment

Classical stochastic resonance requires a periodic signal. We generalize to **noise-assisted threshold crossing** (NATC), which applies to aperiodic signals.

Definition 4.2 (Noise-Assisted Threshold Crossing)**.** *Consider a system with potential barrier ΔU and noise intensity D. The Kramers escape rate is:*

$$r_K = \frac{\omega_0 \omega_b}{2\pi\gamma} \exp\left(-\frac{\Delta U}{D}\right) \tag{16}$$

where ω_0 is the well frequency, ω_b is the barrier frequency, and γ is friction.

Proposition 4.1 (Lumina-Modified Barrier)**.** *The consciousness field modifies the effective* *barrier height:*

$$\Delta U_{eff} = \Delta U - \epsilon|\Xi|^2 \cos(\mathcal{S} - \mathcal{S}_{target}) \tag{17}$$

where $\mathcal{S}_{target}$ is the phase corresponding to the intended outcome and ϵ is the coupling strength.

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

The modified escape rate becomes:

$$r'_K = r_K \cdot \exp\left(\frac{\epsilon|\Xi|^2 \cos(\Delta\mathcal{S})}{D}\right) \tag{18}$$

For alignment ($\Delta\mathcal{S} = 0$), the rate increases exponentially. For misalignment ($\Delta\mathcal{S} = \pi$), it decreases.

4.5 Lindblad Dynamics: Observer-Biased Decoherence

The interaction between consciousness and quantum systems is formalized using the Lindblad master equation.

Definition 4.3 (Lindblad Evolution)**.** *The density matrix ρ of a quantum system coupled to an observer evolves as:*

$$\frac{d\rho}{dt} = -\frac{i}{\hbar}[H, \rho] + \sum_k \gamma_k \left(L_k \rho L_k^\dagger - \frac{1}{2}\{L_k^\dagger L_k, \rho\}\right) \tag{19}$$

where L_k are Lindblad operators representing decoherence channels.

Postulate 4.2 (Consciousness-Biased Decoherence)**.** *In the presence of a consciousness field, the decoherence rates γ_k acquire a directional bias:*

$$\gamma_k \to \gamma_k^{(0)} + \delta\gamma_k(\Xi) \tag{20}$$

where:

$$\delta\gamma_k(\Xi) = \kappa|\Xi|^2 \, |\langle\psi_k|\mathcal{S}\rangle|^2 \tag{21}$$

Here, $|\psi_k\rangle$ is the pointer state associated with channel k, and $|\mathcal{S}\rangle$ is the state corresponding to the observer's prior.

This means: the observer doesn't collapse the wavefunction to an arbitrary state. Rather, decoherence preferentially "funnels" the system toward states aligned with the prior. This is **selection**, not creation.

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. Instead, it biases the 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. The total energy budget is:

$$E_{\text{total}} = E_{\text{system}} + E_{\text{ZPF}} + E_{\text{observer}} \tag{22}$$

The observer expends metabolic energy (~ 20 W) to maintain the coherent Ξ field. This energy goes into maintaining low entropy in the brain, not into the target system. The target system'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 (RNG) outputs correlated with operator intention. The meta-analytic effect size is:

$$z \approx 0.0003 \text{ (per bit)} \tag{23}$$

This corresponds to a probability shift of approximately $p = 0.50015$ from the null $p = 0.5$.

Proposition 4.2 (Coupling Constant Estimate). *From the PEAR effect size, we can estimate the effective coupling:*

$$\epsilon_{eff} = \frac{\delta p}{\sqrt{\Phi} \cdot \chi(\lambda_{max})} \tag{24}$$

For a human observer with $\Phi \sim 10^{10}$ bits (rough IIT estimate) and an RNG with $\lambda_{max}\tau \sim 1$:

$$\epsilon_{eff} \sim 10^{-8} \textit{ to } 10^{-9} \tag{25}$$

This is consistent with hidden sector mixing parameters $\epsilon \sim 10^{-4}$ suppressed by additional geometric factors.

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 defined as a **Probability Tunneling** event. High-density Ξ creates a standing wave in the A_μ field. Through resonance with the ZPF, this wave biases the random fluctuations, making a statistically unlikely event inevitable over sufficient attempts.

Definition 5.1 (Probability Tunneling Rate)**.** *The rate of "impossible" events (barrier-crossing) under Lumina influence:*

$$\Gamma_{tunnel} = \Gamma_0 \exp\left(\frac{\epsilon|\Xi|^2\chi(\lambda_{max})}{D}\right) \tag{26}$$

where Γ_0 is the baseline tunneling rate. Events with $\Gamma_0 \sim 10^{-6}$ can become $\Gamma_{tunnel} \sim 10^{-2}$ under strong coherent intention in chaotic systems.

5.3 Macroscopic Susceptibility

The math explains why observers can influence fluid or chaotic dynamics (High Chaos) but not static solids (Low Chaos). The amplification factor of noise-assisted threshold crossing scales with the system's instability.

System	$\lambda_{\mathbf{max}}$ **(s^{-1})**	**Susceptibility** χ
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	$0.1 - 0.5$	$1.1 - 1.6$

Table 1: Estimated Lyapunov exponents and susceptibilities for various systems ($\tau = 1$ s).

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.

5.5 Group Coherence Effects

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

$$|\Xi_{total}|^2 = \left|\sum_{i=1}^{N} \Xi_i\right|^2 = N^2|\Xi_0|^2 \quad \textit{(coherent)} \tag{27}$$

versus:

$$|\Xi_{total}|^2 = N|\Xi_0|^2 \quad \textit{(incoherent)} \tag{28}$$

Coherent groups thus have N-fold enhancement over incoherent aggregation, analogous to Dicke superradiance.

This provides a mechanism for collective intention effects and explains why focused groups report stronger "manifestation" outcomes.

5.6 Temporal Considerations: Block Universe and Selection

The Lindblad formalism operates on the density matrix at a given time. However, in a block universe interpretation:

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. Rather, it is a boundary condition: the observer at t_1 is part of the consistent history that selected the outcome at t_0. This is analogous to the delayed-choice quantum eraser, where the choice of measurement determines which correlations manifest.

6 Derived Principles

The mathematical framework yields ten operational principles that describe how consciousness-mediated probability bias manifests in practice. These are *corollaries* of the formalism, not independent axioms.

1. **Signal Dominance.** Observers exist on a continuous spectrum of integrated information density. Those with higher Φ generate stronger Lumina fields ($|A_\mu| \propto |\Xi|^2$) and exert proportionally greater bias on probability distributions. At the low-density limit, observers primarily *receive* consensus reality. At the high-density limit, observers actively *transmit* probability configurations.

Formal basis: The Lumina field strength scales with $|\Xi|^2$; the barrier modification $\Delta U_{\text{eff}} \propto \epsilon|\Xi|^2$.

2. **Material Memory.** Physical objects in prolonged contact with high-Φ observers accumulate standing wave patterns in the Lumina field. These patterns persist due to low Lyapunov exponents (stability), effectively storing prior configurations as localized probability wells.

   Formal basis: Topological charge Q is conserved; stable systems ($\lambda_{\text{max}} < 0$) resist decay of informational imprints.

3. **Vacuum Receptivity.** The quantum vacuum is not inert but constitutes a stochastic reservoir (ZPF) that carries informational modulation. The vacuum "listens" in the sense that zero-point fluctuations $\eta(x)$ serve as the carrier wave for Lumina-mediated bias.

   Formal basis: The Langevin equation (Eq. 5) couples observer signal $\epsilon A(t)$ to noise $\eta(t)$.

4. **Chaos Susceptibility.** Systems with positive Lyapunov exponents amplify microscopic biases into macroscopic outcomes. The susceptibility $\chi(\lambda_{\text{max}})$ determines which systems yield to observer influence. Unstable systems (fluids, crowds, RNGs) respond; stable systems (crystals, rigid bodies) resist.

   Formal basis: Lyapunov susceptibility $\chi = e^{\lambda_{\text{max}}\tau}$ (Def. 3.5); see Table 1.

5. **Observer as Field.** The observer is not a point-like entity but a spatially extended region of integrated information. The field $\Xi(x)$ defines the observer's boundary; the phase $\mathcal{S}(x)$ encodes beliefs as topological configurations.

   Formal basis: Coarse-grained field definition (Eq. 2); $\Xi(x) = \sqrt{\Phi(x)}e^{i\mathcal{S}(x)}$.

6. **Intent as Negentropy.** Focused intention generates coherent Lumina flux, which acts as a negentropy current—reducing local entropy by organizing stochastic fluctuations into ordered outcomes. The emotional intensity correlates with field amplitude.

   Formal basis: Lumina as $U(1)$ gauge boson; information current $J^\mu_{\mathcal{I}}$ (Eq. 6).

7. **Temporal Softening.** All systems possess time-dependent susceptibility. Rigid barriers in the present moment become increasingly susceptible to bias over extended timescales as thermal fluctuations accumulate and Lyapunov exponents shift toward instability.

   Formal basis: Time-integrated noise accumulation in Kramers escape rate; τ-dependence of $\chi(\lambda_{\text{max}})$.

8. **Proximity Gradient.** The Lumina field has finite range $r_L = \hbar/m_A c$. Observer effects decay exponentially with distance: $\sim e^{-r/r_L}$. The strongest probability bias occurs within the local "interaction volume" of the observer.

   Formal basis: Massive gauge boson confinement; $m_A \sim 10^{-7}$ eV implies $r_L \sim 1$ m.

9. **Retrocausal Selection.** In the block universe interpretation, observer priors at the time of measurement constrain the branching structure of earlier stochastic events. This is selection, not signaling—the future observation is part of the consistent history.

Formal basis: Postulate 4.3; Lindblad dynamics with temporal boundary conditions.

10. **Coherent Amplification.** When N observers align their prior phases on a common target, the total Lumina field scales as N^2 (superradiant), not N (incoherent). Group coherence produces nonlinear amplification of probability bias.

    Formal basis: Superradiance analogy (Proposition 5.1); $|\Xi_{\text{total}}|^2 = N^2|\Xi_0|^2$.

6.1 Ethical Considerations

Principle I (Signal Dominance) predicts differential reality-shaping capacity among observers. This requires explicit ethical 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 will show enhancement at f, distinguishing from broadband noise.
- **Lyapunov Scaling:** Effect sizes in intention experiments should correlate with the measured Lyapunov exponent of the target system. High-chaos systems (turbulent flows, RNGs) should show larger effects than low-chaos systems (crystals, rigid bodies).
- **Distance Decay:** Effect magnitude should decay with distance as $\sim e^{-r/r_L}$ where r_L is the Lumina range. Testable via RNG networks at varying distances from operator.
- **Group Scaling:** For N coherent operators, effect size should scale as N^2 (superradiant), not N (incoherent). Testable via group meditation experiments with careful phase alignment protocols.

- **Topological Persistence:** Strongly-held beliefs (high winding number $|Q|$) should show resistance to contrary evidence that scales with $|Q|$. Testable via cognitive psychology experiments measuring belief updating rates.
- **Object Memory:** Objects in prolonged contact with high-Φ observers should show measurable bias in subsequent RNG experiments. Testable via "intention-imprinted" objects in blind protocols.

8 Theoretical Constraints

We acknowledge this is an Effective Field Theory (EFT).

1. **Renormalization:** We assume a cutoff scale Λ_{cut} below the Planck mass to avoid UV divergences. The theory is not UV-complete; it describes low-energy phenomena.
2. **Energy Scale:** We rely on Landauer's Principle to justify the metabolic cost of information processing. The selection mechanism avoids energy injection into target systems.
3. **Standard Model Compatibility:** By placing Ξ in a Hidden Sector with weak mixing $\epsilon \sim 10^{-4}$, we avoid conflict with current LHC bounds on dark photons. The Lumina mass $m_A \sim 10^{-7}$ eV places it in the ultra-light regime, evading direct detection but allowing macroscopic effects.
4. **No Superluminal Signaling:** The Lindblad dynamics respect causality. Selection occurs locally; correlations appear in post-selected ensembles.
5. **Thermodynamic Consistency:** The observer-system coupling decreases total entropy of the combined system (observer expends metabolic free energy to maintain coherent Ξ). The second law is satisfied when including the observer's entropy production.

9 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:** Pudding Theory explains the *dynamics* of consciousness fields but not *why* there is subjective experience. The explanatory gap remains.
3. **Measurement Problem:** Does Lindblad-biased decoherence fully resolve the measurement problem, or does it relocate it to the observer-definition problem?
4. **Free Will:** If priors $\mathcal{S}(x)$ determine intention, what determines the priors? Is there genuine agency or computational determinism?
5. **Non-Human Observers:** What is the threshold Φ for "observer" status? Do animals, AIs, or collective systems generate Lumina?

10 Conclusion

Pudding Theory offers a robust, 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. The universe is not a static clockwork; it is a stochastic system that yields to informational shear. We are the shear.

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A Derivation of the Coarse-Grained Field

Starting from a discrete lattice of information-processing nodes with integrated information Φ_i and phases $\mathcal{S}_i$, we construct the continuum limit.

Define the discrete field:

$$\Xi_{\text{discrete}} = \sum_i \sqrt{\Phi_i} e^{i\mathcal{S}_i} \delta^{(3)}(x - x_i) \tag{29}$$

Apply Gaussian smoothing:

$$\Xi(x) = \int d^3y \, K_\sigma(x - y) \Xi_{\text{discrete}}(y) = \sum_i \sqrt{\Phi_i} e^{i\mathcal{S}_i} K_\sigma(x - x_i) \tag{30}$$

where:

$$K_\sigma(r) = \frac{1}{(2\pi\sigma^2)^{3/2}} e^{-r^2/2\sigma^2} \tag{31}$$

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

B Lindblad Operator Construction

The Lindblad operators for consciousness-biased decoherence take the form:

$$L_k = \sqrt{\gamma_k^{(0)} + \kappa |\Xi|^2 |\langle \psi_k | \mathcal{S} \rangle|^2} \, |\psi_k\rangle\langle\psi_k| \tag{32}$$

where $|\psi_k\rangle$ are the pointer basis states (eigenstates of the interaction Hamiltonian with the environment), and $|\mathcal{S}\rangle$ is constructed from the observer's prior field:

$$|\mathcal{S}\rangle = \sum_k c_k(\mathcal{S}) |\psi_k\rangle \tag{33}$$

with coefficients determined by the Fourier decomposition of the prior field over the relevant spatial region.

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 σ	—	~ 1 mm
VEV in brain	v	$\sim 10^5$ (information units)

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