

Pudding Theory: A Unified Framework of Spacetime, Information, and Consciousness

Sterling Geisel
The QBist Lab

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 field-theoretic framework in which spacetime, information, and a consciousness substrate interact via a mediating Abelian vector process (Lumina). The consciousness degree of freedom is modeled by a complex scalar Ξ (with $C \equiv \sqrt{2} \operatorname{Re} \Xi$ at low energy); priors are formulated as slow fields on a statistical manifold endowed with the Fisher–Rao metric. We construct a gauge-invariant action, derive healthy equations of motion, and place laboratory-relevant signatures in the language of effective field theory and open quantum dynamics (completely positive, trace-preserving). 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: consciousness, vibe cloud, Lumina, priors, spacetime, gauge invariance, pudding storm, 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 and open

quantum systems, enabling direct confrontation with data. The math is real. The predictions are explicit. The claims are falsifiable.

1 Introduction

Pudding Theory posits three foundational components:

- **Spacetime:** A differentiable manifold with metric $g_{\mu\nu}$, governed by general relativity.
- **Information:** All potential configurations, quantified by statistical mechanics and information theory.
- **Consciousness substrate:** A field representing raw awareness.

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

Field content and consistency. We adopt a complex scalar $\Xi = (v + \sigma)e^{i\varphi/v}$; the original real variable is recovered as $C \equiv \sqrt{2} \operatorname{Re} \Xi$ (unitary gauge). Lumina is an Abelian vector A_μ with field strength $F_{\mu\nu}$. Priors are represented by slow fields $\theta_i(x)$ living on a statistical manifold with Fisher–Rao metric $G_{ij}(\theta)$. This choice supports gauge invariance, healthy low-energy dynamics, and compatibility with no-signaling.

Quick Terminology Bridge

Technical Term	Narrative / Plain-Language Equivalent
Complex scalar Ξ with $C \equiv \sqrt{2} \operatorname{Re} \Xi$	Consciousness substrate or raw awareness in spacetime.
Abelian vector A_μ	Lumina or spark, a mediating flow that binds thought to matter.
Priors field $\theta_i(x)$ on Fisher–Rao manifold	Bayesian expectations that weight probabilities.
Composite functional $V[\Xi, A, \theta]$	Vibe cloud, the local probability engine that sets dephasing rates.
Overlap of V from many agents	Pudding storm, a crowd-sourced reality-bending event.
Open system collapse-like event	Spark moment, when a possibility becomes a stable fact.

2 Fundamental Concepts

2.1 Spacetime

Spacetime carries metric $g_{\mu\nu}$ and curvature R . Einstein equations read

$$G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}. \quad (1)$$

2.2 Information

Information measures possible configurations. A standard choice is Shannon entropy $I = -k_B \sum_i p_i \ln p_i$, which sets thermodynamic relations. We also give information a geometric face via the Fisher–Rao metric.

2.3 Consciousness Field

The consciousness degree of freedom is modeled by a complex scalar $\Xi(x)$ so that modulus and phase carry awareness variables while enabling gauge-invariant couplings. The low-energy real field is $C \equiv \sqrt{2} \operatorname{Re} \Xi$.

2.4 Lumina Field

Lumina is an Abelian gauge field A_μ with $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$. If Ξ takes a vacuum expectation value v , then A_μ acquires a mass $m_A = g v$.

2.5 Priors as Fields

Let $\theta_i(x)$ parameterize local expectations; equip θ -space with the Fisher–Rao metric $G_{ij}(\theta)$. This makes priors dynamical and measurable.

3 Mathematical Framework

3.1 Action

$$S = \int d^4x \sqrt{-g} \left[\frac{c^3}{16\pi G} R - \frac{1}{4} F_{\mu\nu} F^{\mu\nu} + |D_\mu \Xi|^2 - \lambda \left(|\Xi|^2 - \frac{v^2}{2} \right)^2 + \xi |\Xi|^2 R + \frac{\kappa}{2} g^{\mu\nu} G_{ij}(\theta) \partial_\mu \theta^i \partial_\nu \theta^j - V_\theta(\theta) \right], \quad (2)$$

with $D_\mu = \nabla_\mu - igA_\mu$.

3.2 Field Equations

$$\nabla_\mu F^{\mu\nu} = g \operatorname{Im}(\Xi^* D^\nu \Xi), \quad (3)$$

$$D_\mu D^\mu \Xi + \lambda \left(|\Xi|^2 - \frac{v^2}{2} \right) \Xi + \xi R \Xi = 0, \quad (4)$$

$$G_{\mu\nu} = \frac{8\pi G}{c^4} (T_{\mu\nu}^\Xi + T_{\mu\nu}^A + T_{\mu\nu}^\theta + T_{\mu\nu}^{\text{SM}}). \quad (5)$$

3.3 Open Quantum Dynamics (No Nonlinear Schrödinger)

Laboratory probes are described by a completely positive, trace-preserving master equation

$$\dot{\rho} = -\frac{i}{\hbar} [H_0 + H_{\text{int}}(A_\mu, \Xi), \rho] + \sum_a \gamma_a \left(L_a \rho L_a^\dagger - \frac{1}{2} \{L_a^\dagger L_a, \rho\} \right), \quad (6)$$

where L_a and γ_a encode correlators in the Pudding sector. This nests collapse-like phenomenology without signaling.

4 Implications

4.1 Unification of Physics and Consciousness

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

4.2 Observer Effect and Collapse

Observation corresponds to environmental changes that modify the Lindblad structure seen by a system. The composite $V[\Xi, A, \theta]$ sets the local noise spectrum that selects outcomes via environment-induced superselection.

4.3 Quantum Gravity Interface

The curvature coupling $\xi|\Xi|^2 R$ and stress-energy of the Pudding sector shift gravity minutely, testable by gravity-mediated entanglement and precision accelerometry.

4.4 Neuroscience and Mind

The priors field $\theta_i(x)$ implements predictive processing in field form: the brain acts as an adaptive receiver minimizing a free-energy-like functional on its Fisher–Rao manifold.

4.5 Philosophy

Operationally compatible with panpsychist intuitions while agnostic about qualia; awareness correlates with Ξ and θ dynamics.

5 Testable Predictions

- Additional dephasing in matter-wave interferometry with rate Γ_{Pud} determined by Pudding correlators $S_{\Phi}(\omega)$.
- Extra momentum diffusion D_{pp}^{Pud} in mechanical oscillators from force noise $S_{FF}^{\text{Pud}}(\omega)$.
- Tiny modifications in gravity-mediated entanglement growth due to background Pudding fluctuations.
- Strict nulls for human presence: any *claimed* human-dependent effect must survive blinded analysis that isolates cognitive tasks from instruments.

6 Experimental Proposals

6.1 Quantum Interference

Perform electron/atom interferometry and fit visibility $V = V_0 \exp[-\Gamma_{\text{Pud}}]$. Publish bounds or, if present, a clearly pre-specified discovery claim.

6.2 Entanglement/Decoherence

Test whether entangled pairs acquire excess dephasing when one path samples engineered fluctuations mimicking A_μ or σ noise.

6.3 Astrophysical Observations

Search for small anomalies in lensing/background correlations from Ξ and A_μ stress-energy (secondary to tabletop tests).

6.4 Laboratory Detection of Field Excitations

Use SQUIDS/superconducting resonators for narrowband noise consistent with a massive A_μ ; translate nulls into bounds on g and m_A .

7 Roadmap

1. **Theory:** extend the EFT with higher-derivative operators subject to positivity/analyticsity; compute correlators; publish parameter maps.
2. **Experiment:** partner with quantum optics and optomechanics labs for noise spectroscopy and visibility tests.
3. **Estimation:** translate collapse-model bounds into Pudding bounds (Appendix C) and publish combined exclusion plots.
4. **Community:** publish protocols, release code/data, and invite replication.

8 Conclusion

We present a narrative-matched, gauge-invariant action with open-system dynamics. The framework meets physics where it lives and is ready for decisive tests: either a clear, distinctive signal emerges in precision data, or the resulting exclusion plots compel model revision and tighter claims. Either outcome advances the conversation about consciousness and physics.

Appendix A: Correlators and Kernels

Assume stationary Gaussian noise with correlators

$$\langle A_\mu(x) A_\nu(x') \rangle = \int \frac{d\omega}{2\pi} S_{\mu\nu}(\omega) e^{-i\omega(t-t')} C_\ell(|x - x'|). \quad (7)$$

The induced phase-noise functional takes the form

$$\Gamma_{\text{Pud}} = \frac{1}{\hbar^2} \int \frac{d\omega}{2\pi} S_\Phi(\omega) |\tilde{f}(\omega)|^2. \quad (8)$$

Appendix B: Positivity and Dispersion

Higher-derivative operators in the vector/scalar sectors must satisfy positivity bounds from analyticity/unitarity of scattering amplitudes, blocking superluminal modes in the low-energy theory.

Appendix C: Mapping to CSL Language

For white noise with rate λ and correlation length r_c , the momentum diffusion for a rigid body scales as $D_{pp} \propto \lambda f(r_c)$. The Pudding sector reproduces this with appropriate choices of $S_{FF}^{\text{Pud}}(\omega)$ and C_ℓ , allowing direct translation between CSL bounds and Pudding parameters.

References

- [1] Chalmers, D. (1996). *The Conscious Mind: In Search of a Fundamental Theory*. Oxford University Press.
- [2] Hameroff, S., & Penrose, R. (2014). Consciousness in the universe: A review of the Orch OR theory. *Physics of Life Reviews*, 11(1), 39–78.
- [3] Kafatos, M., Tanzi, R. E., & Chopra, D. (2011). How consciousness becomes the physical universe. *Journal of Cosmology*, 14, 3–14.
- [4] Misner, C. W., Thorne, K. S., & Wheeler, J. A. (1973). *Gravitation*. W. H. Freeman.
- [5] Penrose, R. (1994). *Shadows of the Mind*. Oxford University Press.
- [6] Rovelli, C. (1996). Relational quantum mechanics. *International Journal of Theoretical Physics*, 35(8), 1637–1678.
- [7] Tegmark, M. (2015). Consciousness as a state of matter. *Chaos, Solitons and Fractals*, 76, 238–270.
- [8] Tononi, G. (2008). Consciousness as integrated information. *The Biological Bulletin*, 215(3), 216–242.
- [9] von Neumann, J. (1955). *Mathematical Foundations of Quantum Mechanics*. Princeton University Press.
- [10] Lindblad, G. (1976). On the generators of quantum dynamical semigroups. *Commun. Math. Phys.*, 48, 119–130.
- [11] Gisin, N. (1990). Weinberg’s nonlinear quantum mechanics and superluminal communications. *Phys. Lett. A*, 143, 1–2.

- [12] Polchinski, J. (1991). Weinberg’s nonlinear quantum mechanics and the EPR paradox. *Phys. Rev. Lett.*, 66, 397–400.
- [13] Bassi, A., Lochan, K., Satin, S., Singh, T. P., & Ulbricht, H. (2013). Models of wave function collapse and experimental tests. *Rev. Mod. Phys.*, 85, 471–527.
- [14] Vinante, A., et al. (2017). Improved noninterferometric test of collapse models using ultracold cantilevers. *Phys. Rev. Lett.*, 119, 110401.
- [15] Adams, A., Arkani-Hamed, N., Dubovsky, S., Nicolis, A., & Rattazzi, R. (2006). Causality, analyticity and an IR obstruction to UV completion. *JHEP*, 10, 014.
- [16] Jacobson, T. (2008). Einstein–aether gravity: a status report. *arXiv:0801.1547*.
- [17] Heisenberg, L. (2014). Generalization of the Proca action. *arXiv:1402.7026*.
- [18] Amari, S. (2016). *Information Geometry and Its Applications*. Springer.
- [19] Friston, K. (2010). The free energy principle. *Nat. Rev. Neurosci.*, 11, 127–138.