Surreal Recursive Idealist Physics: A Deterministic Framework Unifying Quantum Mechanics, Gravity, and Consciousness

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Abstract

Surreal Recursive Idealist Physics (SRIP) reimagines reality as a deterministic projection of an infinite-dimensional consciousness, encoded with surreal numbers ($\mathbb{S}$). Physical constants—the fine-structure constant ($\alpha \approx 1/137$), speed of light ($c \approx 3 \times 10^8 \, \text{m/s}$), and gravitational coupling ($\phi_G \sim 10^{-38}$)—emerge as fixed points of recursive self-interaction. Surreal infinitesimals (ϵ_m) resolve quantum paradoxes, while a coherence-driven collapse projects infinite dimensions into 3+1D spacetime. SRIP predicts testable deviations in the cosmic microwave background (CMB), gravitational waves, and spectroscopy, offering a revolutionary alternative to materialist physics.

1 Introduction

Modern physics teeters on unresolved paradoxes: quantum mechanics (QM) thrives yet stumbles over the measurement problem and Bell's theorem, while general relativity (GR) governs gravity but resists quantum unification. Surreal Recursive Idealist Physics (SRIP) rejects materialism, positing an infinite-dimensional consciousness as the substrate of reality, recursively projecting 3+1D spacetime via surreal numbers ($\mathbb{S}$). Fusing *Surreal Quantum Field Theory* (SQFT) and *Recursive Idealist Physics* (RIP), SRIP unifies QM, GR, and consciousness, resolving foundational issues with a deterministic framework and falsifiable predictions.

2 Theoretical Framework

2.1 Consciousness as Infinite-Dimensional Substrate

SRIP models consciousness as an infinite-dimensional Hilbert space C^∞, where states $|C_n\rangle$ represent recursive self-reflections. The recursive operator is:

$$R(C) = C \cdot \langle C| \, \hat{A} \, |C\rangle$$

$\hat{A}$, self-adjoint, has eigenvalues $\lambda_m = 1/n_m$, with n_m as primes (e.g., 137) to minimize recursive degeneracy and suppress entropy. These map to surreal infinitesimals $\epsilon_m \in \mathbb{S}$,

potentially non-commutative to reflect time's asymmetry.[1]

2.2   Projection Mechanism

The infinite-D manifold collapses to 3+1D via:

$$\mathcal{L}[C] = \arg\min_D (E(D) - S(D))$$

where $E(D)$ is experiential coherence and $S(D)$ is structural richness. For $D = 4$, $E \approx S$, stabilized by $\kappa_D = 1/\sqrt{n_D}$.

3   Surreal Numbers and Determinism

3.1   Mechanics of Surreal Numbers

Surreal numbers ($\mathbb{S}$), per Conway [1], extend reals with infinitesimals and infinities. In SRIP, $\epsilon_m = \frac{-1+\sqrt{1+\frac{4}{n_m}}}{2}$ tags states. For $n_{137} = 137$:

$$\epsilon_{137} = \frac{-1 + \sqrt{1 + \frac{4}{137}}}{2}$$

$$\sqrt{1 + \frac{4}{137}} \approx 1.0145, \quad \epsilon_{137} \approx \frac{0.0145}{2} \approx 0.00725 \approx \frac{1}{137.93}$$

This locks $\alpha \approx 1/137.036$, a fixed point where recursive splitting balances interaction strength.

3.2   Quantum Mechanics

The density matrix is:

$$\rho = \sum_i (p_i + \epsilon_{n_i}) \left|\psi_i\right\rangle \left\langle\psi_i\right|$$

Evolution via:

$$H = H_0 + \epsilon_{n_m} H_1$$

Measurement:

$$P(o_i) = \frac{e^{\epsilon_{n_i}/\tau}}{\sum_j e^{\epsilon_{n_j}/\tau}}, \quad \tau \to 0^+$$

This resolves the measurement problem and Bell's theorem locally.

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[1]SRIP assumes a generalized, possibly non-commutative extension of Conway's surreals to capture recursive asymmetries, e.g., time directionality.

4 Physical Constants

4.1 Fine-Structure Constant

$\epsilon_{137} \approx \alpha$, derived above, reflects electromagnetic coherence.

4.2 Speed of Light

$$c = \frac{1}{\epsilon_{137}} \cdot k$$

With $k \approx 2.19 \times 10^6 \, \text{m/s}$, $c \approx 3 \times 10^8 \, \text{m/s}$.

4.3 Gravitational Coupling

$$\phi_G = \epsilon_{n_G} = \frac{\kappa_4^2}{n_G}, \quad n_G = 137 \cdot 10^{76}$$

$$\phi_G \approx \frac{0.0073}{1.37 \times 10^{78}} \sim 10^{-38}$$

5 Projection to 3+1D Spacetime

5.1 Coherence Collapse

$$\kappa_D = \frac{1}{\sqrt{n_D}}, \quad \kappa_4 \approx 0.0855$$

Time's directionality stems from recursive non-commutativity, distinguishing it from spatial isotropy.

5.2 Logos Optimization

$$\mathcal{L}[C] = \arg \min_D (E(D) - S(D))$$

6 Experimental Predictions

6.1 CMB Deviations

$$\Delta \mathcal{P}(k) = \sum_m \frac{\kappa_m}{m} \cos\left(\frac{k}{k_m}\right) + \epsilon_m^2 \ln\left(\frac{k}{k_*}\right)$$

$k_* \approx 10^{-30} \, \text{m}^{-1}$ (Planck scale crossover). At $l = 3000$:

$$\Delta C_l / C_l \approx 10^{-10}$$

Testable with CMB-S4.

6.2 Gravitational Waves

$$\delta\phi(f) = \epsilon_{n_G} \left(\frac{f}{f_0}\right)^2$$

For $f = 10^{-2}\,\text{Hz}$, $f_0 = 100\,\text{Hz}$, $\epsilon_{n_G} \sim 10^{-38}$:

$$\delta\phi \sim 10^{-10}\,\text{radians}$$

LISA-detectable.

6.3 Spectroscopic Anomalies

$$\frac{\delta E}{E} = \epsilon_{137}\alpha^2 \approx 0.00725 \cdot (1/137)^2 \approx 10^{-17}$$

Optical clocks can probe this.

7 Discussion

SRIP redefines reality as a projection of infinite-D consciousness, with surreal numbers encoding determinism. Entanglement reflects infinite-D coherence signatures; free will emerges locally within global determinism; recursive operations may counter entropy.

8 Conclusion

SRIP unifies QM, GR, and consciousness, delivering a testable, deterministic paradigm shift.

References

[1] J. H. Conway, *On Numbers and Games*, Academic Press, 1976.

[2] S. Hossenfelder, T. Palmer, *Rethinking Superdeterminism*, Frontiers in Physics, 8, 139, 2019.