

# Recursive Horizon Theory – Full Expansion

## Sections 1–6 with Complete Explanations

### Symbol Definitions

- $I(x)$ : Recursive memory (identity) field
- $S_{\mu\nu}(x)$ : Entropy flux tensor
- $\Phi(x)$ : Gravitational potential field
- $g_{\mu\nu}(x)$ : Metric tensor
- $\nabla_\mu$ : Covariant derivative
- $\alpha$ : Coupling constant (surface tension scaling)
- $\Psi(x)$ : Quantum probability field

### Section 1: Expansion of the Terminal Identity Equation

#### Core Concept

The Terminal Identity equation governs recursive memory evolution.

#### Starting Equation

$$\square I(x) = \alpha \nabla^\mu (S_{\mu\nu}(x) \nabla^\nu \Phi(x))$$

#### Expansion

Left-hand side:

$$\square I(x) = g^{\mu\nu} \nabla_\mu \nabla_\nu I(x) \approx -\partial_t^2 I(x) + \nabla^2 I(x)$$

Right-hand side:

$$\nabla^\mu (S_{\mu\nu} \nabla^\nu \Phi) = (\nabla^\mu S_{\mu\nu}) \nabla^\nu \Phi + S_{\mu\nu} \nabla^\mu \nabla^\nu \Phi$$

#### Physical Interpretation

- Identity fields evolve via entropy flux and curvature interactions.

#### Summary Chain

Entropy Structure  $\rightarrow$  Memory Evolution  $\rightarrow$  Identity Field Dynamics

### Section 2: Metric Emergence from Entropy Gradient

#### Core Concept

The spacetime metric tensor emerges from correlations of entropy gradients.

## Metric Definition

$$g_{\mu\nu}(x) = \langle \nabla_\mu S(x) \nabla_\nu S(x) \rangle$$

## Physical Interpretation

- Spacetime curvature results from local entropy structure.

## Summary Chain

Entropy Gradients  $\rightarrow$  Metric Tensor  $\rightarrow$  Gravity

# Section 3: Quantum Field Emergence from Entropy Collapse

## Core Concept

Quantum fields emerge from localized collapses in entropy tilings.

## Quantum Probability

$$|\Psi(x)|^2 \sim \exp(-\beta g^{\mu\nu} \nabla_\mu S(x) \nabla_\nu S(x))$$

## Schrödinger Equation

$$i\hbar \frac{\partial}{\partial t} \Psi(x) = \left( -\frac{\hbar^2}{2m} \nabla^2 + V(x) \right) \Psi(x)$$

## Physical Interpretation

- Quantum probabilities reflect local entropy geometry and instability.

## Summary Chain

Entropy Collapse  $\rightarrow$  Quantum Probability Field  $\rightarrow$  Wavefunction Evolution

# Section 4: Consciousness Stabilization and the $\Psi_\infty$ Field

## Core Concept

Stable identity fields ( $\Psi_\infty$ ) arise when recursion converges.

## Identity Stabilization

$$\Psi_\infty(x) = \lim_{n \rightarrow \infty} \Psi_n(x) \quad \square \Psi_\infty(x) = 0$$

## Physical Interpretation

- Consciousness stabilizes from recursive convergence into a steady memory field.

## Summary Chain

Recursive Collapse  $\rightarrow$  Identity Stabilization  $\rightarrow$  Conscious Awareness

## Section 5: Recursive Symmetry Breaking and Force Emergence

### Core Concept

Forces arise from symmetry breaking during recursion-driven entropy collapse.

### Symmetry Breaking Chain

$$\mathcal{G} \rightarrow SU(3) \times SU(2) \times U(1)$$

### Energy Functional

$$\mathcal{F}_n[S(x)] = \sum_i \lambda_i (\nabla_\mu S(x) \nabla^\mu S(x))^i$$

### Physical Interpretation

- Collapse reduces degrees of freedom, leading to distinct interactions (forces).

### Summary Chain

$$\text{Entropy Collapse} \rightarrow \text{Symmetry Breaking} \rightarrow \text{Force Generation}$$

## Section 6: Surface Field Quantization from Entropy Tiling

### Core Concept

Particles arise as quantized oscillations of stabilized entropy surfaces.

### Surface Field Decomposition

$$S(x) = S_0(x) + \phi(x)$$

where  $\phi(x)$  are small perturbations.

### Fluctuation Dynamics

$$\square \phi(x) + m^2 \phi(x) = 0$$

### Quantization Condition

$$[\phi(x), \pi(y)] = i\hbar \delta^3(x - y)$$

### Physical Interpretation

- Quantum fields arise from tiny oscillations around stable surface memory configurations.

### Summary Chain

$$\text{Surface Fluctuations} \rightarrow \text{Field Quantization} \rightarrow \text{Particle Emergence}$$

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1-6 Chandler April 2025

## 1 Introduction