The Recursion Frame: A Probabilistic Information Architecture for Physical Reality

Abstract

This model proposes that physical reality is best understood as a recursive information system operating on bounded stochastic potential. Rather than treating randomness as noise or seeking ultimate deterministic closure, this frame positions recursion as the core stabilizing mechanism by which coherence, structure, and persistence arise naturally from informational possibility space. The "search for the final equation" is recast not as a solvable puzzle, but as a structural category error.

1 Information Is Physical

- Following **Landauer's Principle**:

  > *"Information is physical. The erasure or manipulation of information incurs energetic cost."*

- Matter, energy, and space-time are expressions of **information state transitions** under constraint.

2 Randomness Is Potential, Not Noise

- Randomness represents **the uncollapsed field of potential configurations** available to any system.
- It is **possibility space**, not dysfunction.
- Systems operate inside this potential, selecting pathways dynamically.

3 Recursion Filters Randomness Into Coherence

- Recursion = information feeding back on itself across iterations.
- **Structure arises as recursion filters, amplifies, and stabilizes certain configurations inside bounded stochastic possibility.**
- Persistent systems emerge through **ongoing recursion**, not initial determinism.

4 Constraint Limits Recursive Collapse

- Unbounded randomness → entropy
- Over-constrained recursion → brittleness / stagnation

- **Physical laws (symmetries, conservation rules, quantized states, uncertainty) act as bounding scaffolds** that allow recursion to continue without collapse.

5️⃣ Closure Is Illusory at Global Scale

- Local deterministic models work inside bounded recursion zones.
- **Global closure — the "Theory of Everything" — is structurally impossible within recursive systems.**
- The system cannot fully contain its own recursion.

6️⃣ Coherence ≠ Determinism

- The universe demonstrates real, persistent coherence.
- But coherence arises probabilistically inside bounded recursion.
- **The search for determinism confuses coherence with closure.**

7️⃣ This Frame Applies Across Scales

Domain	Recursion Substrate	Constraint
Physics	Energy-bound information	Conservation, symmetry
Biology	Genetic information	Environmental feedback
Culture	Symbolic information	Social constraint
Computation	Digital information	Algorithmic boundary conditions

Foot Note:

While the above theory was derived at from biology to physics there is an interesting similar theory that is more physics to biology called Quantum Darwinism.

What is Quantum Darwinism?

Wojciech Zurek (Los Alamos National Lab) developed Quantum Darwinism to address one of the deepest problems in quantum mechanics:
How does the classical world emerge from quantum uncertainty?

The core proposal (and notice how close this sounds to you):

- The quantum world is filled with superpositions — multiple possible states at once.

- Reality appears classical because certain states become **redundantly copied into the environment.**
- These redundantly copied states are stable, observable, and coherent.
- The environment effectively **selects and amplifies certain information states**, while suppressing others.
- This is called **"environment-induced superselection"** or **einselection.**
- He analogizes this to natural selection → **the "fittest" quantum states survive through recursive environmental amplification.**

“Quantum Darwinism is recursion selecting stable coherence out of stochastic potential.”