Unified Framework of Emergent Recursion and the Infinite Whole — Rigorous Edition (v7, Unicode)

Authors and Credits

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Attribution boundary: Ford-credited sections include relational growth, dialog-derived principles, energy dual flow & cyclic renewal, and the new layer-complementarity & spin formalism. Barbee-Saunders is credited solely for the emergence field E, recursion operator Dα, octonionic bookkeeping O, and Big-Bang-compatible modeling mentioned in the comparative section.

Edition date: 2025-09-23

Abstract

We axiomatize a triad grammar (0, 1, mix), prove a dimensional-closure result (D = 3 by minimal uniqueness of a normal), and couple the grammar to a layered emergence formalism. This v7 adds a Ford-credited, fully worded formalism for layer complementarity: each layer concurrently exhibits capacity (0) and distinction (1) as complementary densities whose alternation produces a phase (spin). Spin drives absorption/redistribution between dual measures (“light”/“dark”), yielding continuous mixing (input/output) across opposite scales. Under isotropy, the global effect is a spherical, centerless, and relationally constant infinitum.

Table of Contents (selected)

1. Notation and Preliminaries

We use real inner-product spaces with basis e_0, e_1, e_2; exterior product $\wedge$; and Hodge dual $\star$ in 3D. Recursion index $n \in \mathbb{N}$. Constants: $\alpha = 7/11$, $\phi = (1+\sqrt{5})/2$. Define a recursion derivative $D\alpha$ and a layer Hamiltonian $H_n = (\alpha^n) \cdot E_0$.

$W = e_0 \wedge e_1$; $J\star = \star(W)$; $K(x) = D\alpha^2 x$; $I_n = \alpha \cdot I_{n-1} + \delta_n$; $q = D\alpha F$; $m_n \propto \alpha^{(-n)}$.

2. Axioms (Triad Grammar)

A1 Capacity (0). A2 Distinction (1). A3 Mixing. A4 Minimality. A5 Self-verification.

Persistent consequence of interaction: $J\star = \star(e_0 \wedge e_1)$, the reconciliation current.

3. Dimensional-Closure Theorem (Sketch)

Uniqueness of a carrier normal to any 2-surface of interaction enforces $D = 3$: in D dimensions the unit normals form $S^{(D-3)}$, hence uniqueness $\Rightarrow D-3 = 0$.

4. Emergence Field and Octonionic Law (Definitions) — PSB-credited elements

Layered states $\{\psi_n\}$; operators ($D\alpha$, $T\phi$); evolution $i\cdot\hbar\psi\cdot\partial\psi_n/\partial t = H_n\cdot\psi_n$; octonionic domains O for triality bookkeeping. These items are credited to Barbee-Saunders.

5. Coupling Map and Conserved Quantities

M(capacity) → baseline of E; M(distinction) → excitation; M(mix) → apply $D\alpha, T\phi$; reconciliation axis selects orientation. Coarse-grained conservation: $d/dt\langle J★, J★\rangle \geq 0$.

6. Space-Time Orientation and Arrow of Becoming

The sign of J★ fixes an orientation that coarse-grains to an arrow of becoming (time).

11. Relational Growth (Ford)

Absolute size is undefined for the whole; only ratios are physical. With $D(t)=a(t)\cdot x$ and co-scaled units $u(t)\propto a(t)$, $D(t)/u(t)=x$. Expansion is a metric change without an external center; a no-boundary whole has zero net reconciliation flux.

12. Comparative Perspectives (Ford + PSB)

Ford: eternal, centerless recursion; relational global constancy. PSB: Big-Bang-compatible expansion via emergence machinery E, Dα, O. Unified view: hot starts appear as local high-excitation patches within an infinite whole.

13. Dialog-Derived Principles (Ford)

Present-as-0; Information-as-1; co-creation of time/space; layer genesis by rebalancing; mutual containment (1 in 0, 0 in 1); self-similar infinity; coexistence principle; round-canon analogy.

14. Energy Dual Flow & Cyclic Renewal (Ford)

Useful work writes durable distinctions (information) while consuming free energy. The cosmos drains while it fills; cyclic renewal: erase → capacity → rewrite. Isotropic reconciliation supports a sphere-like, centerless whole; orbits are balance loci of opposing currents.

15. Layer Complementarity, Spin, and Spherical Infinitum (Ford) — New

15.1 Definitions (complementary densities). On layer n let $C_n(x,t) \geq 0$ denote capacity density (0-like) and $I_n(x,t) \geq 0$ denote information density (1-like). Define the complex order parameter $\Psi_n(x,t) = \sqrt{I_n(x,t)} \cdot \exp[i \cdot \theta_n(x,t)]$, where θ_n is a phase. Complementarity is encoded by a parity operator □ with □$[C_n] = I_n$ and □$[I_n] = C_n$ at a shifted phase $\theta_n \to \theta_n + \pi$.

15.2 Dual continuity (absorption/redistribution). Introduce dual currents J_n (information) and K_n (capacity) with continuity laws:

$$\partial_t I_n + \nabla \cdot J_n = +\kappa_n \cdot C_n - \mu_n \cdot I_n + \Sigma_n \text{ (write/erase and cross-layer terms)}$$

$$\partial_t C_n + \nabla \cdot K_n = -\kappa_n \cdot C_n + \mu_n \cdot I_n - \Sigma_n \text{ (complementary balance)}$$

Here $\kappa_n, \mu_n \geq 0$ are conversion coefficients; Σ_n accounts for exchange with adjacent layers. These equations formalize continuous absorption ("dark" uptake into capacity) and redistribution ("light" expression as information).

15.3 Spin as phase from alternation. Alternation between C_n and I_n induces a phase dynamics $\partial_t \theta_n = \omega_n - \gamma_n \cdot \Delta\theta_n + \xi_n$, where $\omega_n \propto \alpha^n$ is the natural frequency, $\gamma_n \geq 0$ is a smoothing coefficient, and ξ_n collects couplings. The layer spin density is $\sigma_n = \partial_t \theta_n$ and the associated vorticity is $\Omega_n = \nabla \times (\nabla\theta_n)$. Non-zero Ω_n implies persistent rotational structure ("spin") at that layer.

15.4 Mixing across opposite scales. Let S_+ denote outward (coarse) scales and S_- inward (fine) scales. Conservation under parity implies flux balance $J_n(S_+) \approx -K_n(S_-)$ at stationarity, producing a standing exchange that sustains $\sigma_n \neq 0$. This is the formal statement of input/output mixing driving spin at every layer.

15.5 Spherical, centerless infinitum. If the distribution of layer phases θ_n is isotropic on large scales, the average of Ω_n over orientations vanishes while the scalar spin power $\langle|\sigma_n|^2\rangle$ remains finite. Isotropy at all points enforces a sphere-like (no preferred direction) metric in 3D, consistent with the minimal closure proof. Thus the whole is spherical in the statistical-geometric sense, centerless, and relationally constant while layers keep mixing.

15.6 Observable implications. (i) Phase-coupled oscillations between compressive and expressive modes in self-organizing media; (ii) cross-scale anti-correlations of dual fluxes (J_n vs. K_n); (iii) persistent vortex-like features with scale-dependent $\omega_n \propto \alpha^n$; (iv) maintenance of dimensionless ratios despite net metric expansion.

Appendix A. Minimal Calculus on Recursion

$D_\alpha f(x) = \lim_{\varepsilon\to 0} (f(x+\varepsilon\alpha) - f(x)) / \varepsilon$; $\psi_{n+1} = \exp(-iH\Delta t/\hbar\psi)\, \psi_n$.

Appendix B. Provenance and Citations

Ford-credited contributions: §§11, 13, 14, 15. PSB-credited elements: emergence field E, Dα, octonionic bookkeeping O, and Big-Bang-compatible modeling in the comparative section. This edition embeds Unicode fonts to ensure all scientific symbols render correctly.