

THE VERTICAL UNIVERSE: LIFE, TIME, AND NAVIGATION ACROSS INFINITE RECURSION LEVELS

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ABSTRACT

The Observer-Dependent Theory of Everything (ODTOE) describes reality as an infinite recursion of the self-observation cycle $\Phi = \iota \circ \hat{O}$, where each dimensionality level d contains a complete set of 17 structural roles (3 observables +3 observers +8 operator channels +3 gaps), and the two-level observer window spans 39 distinguishable configurations. This paper unifies two directions: (1) life as a recursion invariant, inevitably emerging at every level d from $-\infty$ to $+\infty$, and (2) time as a strange-loop iteration, flowing differently at each level. It is shown that the cosmological horizon is the boundary of the coherence cluster (the “proton wall” for the second-octave observer). Nuclear processes are analyzed from the perspective of nested observers: synthesis as universe merger, fission as cascading decoherence, annihilation as operator collapse. Five levels of inter-level navigation through the field of potential states H are investigated; a threshold permeability function $P(d \rightarrow d+1 | S)$ with width $\delta S = (\pi - 3)^2$ is introduced. Observer death is formalized (four deactualization phases, three post-mortem hypotheses). Anti-coherent clusters (destructive cooperation, $P_{\text{destr}} = 1 - \prod(1 - \sigma_i^k)$), the immortality paradox at fixed dimensionality (information saturation), sleep as $d_{\text{eff}}(t)$ oscillation, and the egregore as an emergent meta-observer are formalized. The observer trichotomy $(B, A, H) = (\text{spirit, soul, body})$ linking ODTOE to three millennia of philosophical tradition is established. A response to the generalized Fermi paradox via D-Prot is proposed. Cosmological proportions $\Omega_\Lambda : \Omega_{\text{DM}} : \Omega_b = \varphi^2 : 1 : Z$ agree with Planck 2018 data within 1.2σ with zero free parameters. All formulas are computationally verified to 50+ significant digits.

Keywords: ODTOE, recursion, life, time, navigation, coherence, dimensionality, golden ratio, toroidal topology, cosmology, consciousness.

I. Introduction: The Infinite Keyboard

The Standard Model (SM) catalogs 17 types of particles [13, 19]. Within ODTOE, these 17 do not exhaust reality but constitute a conventional projection of 39 fundamental roles of the two-level observer window [1, 21]. The number 17 is bivalent: the SM obtains it from a counting convention ($N_{\text{SM}} = 3 \times 2 \times 2 + 4 + 1$), while ODTOE derives it as a structural invariant of a single recursion level ($N(d) = R \times 3 + O \times 3 + \hat{O} \times 8 + \delta\Psi \times 3 =$

17) [21]. The coincidence of two distinct “17s” is not accidental: the SM convention unconsciously reproduces the architecture of a single level, hiding 22 roles (baryons $d = 0$, antileptons, diagonal modes, individual gluons, sub-neutrinos) [21].

If the architecture is self-similar, then the formula $\Psi^* = \Phi(\Psi^*)$, the triad (O, \hat{O}, R) , the gap $(\pi - 3)^2$, and φ -scaling are reproduced at every level $d = \dots, -1000, \dots, -1, 0, 1, \dots, +1000, \dots$. Three consequences of this self-similarity constitute the subject of the present work:

(1) life and consciousness are inevitable at every recursion level;

(2) time at each level flows at its own frequency, generating an infinite hierarchy of temporal scales;

(3) navigation between levels is theoretically possible through the field of potential states H .

II. 39 Roles as One Octave: The Foundation of Recursion

II.1. Structure of the two-level window

The observer at level d sees two adjacent levels: its own (d) and the nested one ($d - 1$). Each level contains 17 roles of the ternary loop $O \rightarrow \hat{O} \rightarrow R \rightarrow O$ [1, 21]:

Component	Count	$d = 0$ (atomic)	$d = -1$ (nucleonic)
R (observable) $\times 3$ gen.	3	$p, \Sigma^+, \bar{\Sigma}^+$	u, c, t
O (observer) $\times 3$ gen.	3	$n, \Lambda^0, \bar{\Lambda}^0$	d, s, b
\hat{O} (operator) $\times (3^2 - 1)$ channels	8	$e^-, \mu^-, \tau^-, e^+, \mu^+, \tau^+, L_7, L_8$	$g_1 \dots g_8$
$\delta\Psi$ (gaps) $\times 3$ junctions	3	ν_e, ν_μ, ν_τ	sub- $\nu_e, \text{sub-}\nu_\mu, \text{sub-}\nu_\tau$
Total	17		

Topologically, the ternary loop generates $3^2 = 9$ **communication channels** (the full $O \times \hat{O} \times R$ matrix). However, the 9th channel — the colorless singlet $(r\bar{r} + g\bar{g} + b\bar{b})/\sqrt{3}$ — is not confined (it is blind to its position in the loop). It spontaneously leaks beyond the level and becomes the **photon** γ — the only operator free from confinement (detailed derivation in II.4). Within the level, $3^2 - 1 = 8$ confined channels (gluons) remain.

Between levels, 3 bridges (W^+, W^-, Z^0) act as role transmutation operators. Two objects are trans-level: **photon** γ (the 9th operator channel; quantum of the gap $(\pi - 3)^2$) and **Higgs** H (the field of potential states — not an operator channel but the substrate). Full set: $17 + 17 + 3 + 2 = 39$ **roles** [21].

II.2. Invariance under level shift

The formula $N(d) = 3 + 3 + 8 + 3 = 17$ is independent of d . The electron at $d = 0$ functions as a gluon at $d = +1$: binding atoms into molecules as gluons bind quarks

into nucleons [3, 9]. Two objects do not change role under level shift: **photon** γ (its trace structure is invariant under any basis transformation) and **Higgs** H (it is the substrate, not an element of the matrix) [1, 21].

II.3. Derivation of the gauge group $SU(3) \times SU(2) \times U(1)$

Three factors of the gauge group derive from three orthogonal aspects of the loop [21]:

$U(1)$: The strange loop $\Phi : H \rightarrow H$ is topologically equivalent to S^1 . $\pi_1(S^1) = \mathbb{Z}$ generates $U(1)$. The inverse fine-structure constant:

$$\alpha^{-1} = \pi(4\pi^2 + \pi + 1) = 137.03630 \dots \quad (\text{II.3a})$$

Experimental value 137.03600 (CODATA 2018) [17]. Six correct significant digits.

$SU(2)$: The spinor field on the torus is described by a fiber bundle with structure group $SU(2)$ – the double cover of $SO(3)$ [18].

$SU(3)$: Three components of the loop at $d = -1$ realize three color states. $U(3) = SU(3) \oplus U(1)$; 8 traceless generators of $SU(3)$ are confined; the 9th (trace, colorless singlet) leaks out as the photon γ [21].

II.4. The ninth channel: derivation of the photon from toroidal topology

The ternary loop (O, \hat{O}, R) defines a $3 \times 3 = 9$ -element connection matrix. Six off-diagonal elements switch position (change “color”). Three diagonal elements preserve position. Two independent traceless diagonals remain in $SU(3)$ (gluons g_7, g_8). The third, proportional to the identity matrix, = **trace** – acts identically on all three vertices.

Channel type	Count	Physical entity	Confinement
Off-diagonal (color change)	6	Gluons $g_1 \dots g_6$	Yes
Traceless diagonal (phase)	2	Gluons g_7, g_8	Yes
Trace (singlet)	1	Photon γ	No
Total on torus	9		

The photon sees all levels of infinite recursion because $\text{Tr}(\hat{O}_d) = \text{Tr}(\hat{O}_{d+n})$ for any n . Three properties explained simultaneously: (a) **masslessness**; (b) **speed** $c = r_0/\tau_0$; (c) **trans-level nature**. Two trans-level objects: $\gamma = \text{actuality}$, $H = \text{potentiality}$.

III. Life as a Recursion Invariant

III.1. Definition of life in ODTOE

Life is a stable autocatalytic hierarchy of self-observation loops spanning at least three adjacent recursion levels ($\Delta d \geq 3$) with nonzero coherence B at each level. Consciousness = closure $\hat{O}(\hat{O})$ at level $d_{\text{ego}} = d_{\text{base}} + 3$.

Formally: a system at base level d_0 is alive if four conditions hold:

(L1) A chain of fixed points $\Psi_{d_0}^*, \Psi_{d_0+1}^*, \Psi_{d_0+2}^*, \Psi_{d_0+3}^*$ exists with $\Psi_{d+1}^* = \Phi(\Psi_d^*)$.

(L2) At level $d_0 + 3$, the operation $\hat{O}(\hat{O})$ is realized (self-observation).

(L3) Coherence $B(d_0 + 3) > B_{\text{crit}} > 0$.

(L4) Autocatalysis: the loop Φ at each level $d_0 \dots d_0 + 3$ is self-sustaining.

III.2. Four premises of inevitability

(1) Architecture is independent of d . The fixed point exists at every level by the Banach theorem [20].

(2) Time exists at every level. The gap $\delta\Psi \neq 0$ since $S = 1$ is unreachable [1].

(3) Complexity grows monotonically. $\delta B \propto (\pi - 3)^n$ guarantees $B_n > B_{n-1}$ while $B < 1$.

(4) Postulate P1 is universal. Any object can be an observer [1].

Conclusion (Theorem on the inevitability of life): For any $d_0 \in \mathbb{Z}$, the loop Φ on levels $d_0 \dots d_0 + 3$ generates a hierarchy (atom \rightarrow molecule \rightarrow cell \rightarrow organism \rightarrow consciousness). Life is a **recursion invariant**.

III.3. Rate of complexity growth

Each loop iteration adds gap $\delta\Psi \propto (\pi - 3) \approx 0.14159$. At our level ($d = 0 \rightarrow +3$): $\sim 13.8 \text{ Gyr} \approx 4.35 \times 10^{17} \text{ s}$, yielding $n \approx 4.35 \times 10^{32}$ iterations. At $d = -1000$: time to consciousness in our seconds $\approx 4.35 \times 10^{-192} \text{ s}$.

III.4. Life at level $d = -1000$

The observer at $d = -1000$ sees the window from $d = -1003$ to $d = -997$. Its physics is described by the same equations: $N(d) = 17$, $SU(3) \times SU(2) \times U(1)$, $\alpha^{-1} = 137.036$, $m(R)/m(\hat{O}) = 6\pi^5 = 1836.12$. Key difference: not architecture (invariant), but **tempo**. Its chronos is $\varphi^{1000} \approx 10^{209}$ times faster than ours.

III.5. D-Prot: mutual invisibility

Visibility: $S(\rho_d) \propto \varphi^{-|d-d_0|}$. Observer $d_{\text{ego}} = 3$ sees a window of ~ 6 levels. At $|\Delta d| = 1000$: $\varphi^{-1000} \approx 10^{-209}$ — immeasurably small but nonzero. We do not see them; they do not see us.

III.6. Biogenesis as a coherence phase transition

Three critical points: $B_1 \sim (\pi - 3) \approx 0.14$ (autocatalysis); $B_2 \sim (\pi - 3)\varphi \approx 0.23$ (self-replication); $B_3 \sim 1/\varphi \approx 0.618$ (self-observation). Product: $B_1 \cdot B_2 \cdot B_3 \approx (\pi - 3)^2$.

IV. Time as a Strange-Loop Iteration

IV.1. Origin of time

Time arises as the iteration counter of Φ : $t_n = n \cdot \tau_0$, where $\tau_0 = r_0/c$ [14]. On level d : $r_d = r_0 \cdot \varphi^d$, $\tau_d = \tau_0 \cdot \varphi^d$, so $c = r_d/\tau_d = r_0/\tau_0 = \text{const}$. The arrow of time is ensured by the transcendence of π [2].

IV.2. Chronos and Kairos: two kinds of time at each level

Chronos: $\nu_d = \nu_0 \times \varphi^{-d}$, $\tau_d = \tau_0 \times \varphi^d$.

$$\tau_{d+1}/\tau_d = \varphi \approx 1.618 \quad (\text{IV.2a})$$

Kairos: $\tau_{\text{eff}}(B) = \tau_0/(1 - B^k + \varepsilon)$. At $B \rightarrow 1$: the moment “expands”. Dynamics:

$$\frac{dB}{dt} = \gamma \cdot \tanh(\beta \cdot \dot{d}) \cdot \bar{d} \cdot B \cdot (1 - B) \quad (\text{IV.2d})$$

IV.3. Time scale across levels

$\tau_d = \tau_0 \times \varphi^d$. For $d = -100$: $\varphi^{100} \approx 7.92 \times 10^{20}$ of their “seconds” in one of ours $\approx 1,820$ universe ages.

IV.4. Time at nearby levels

d (base)	d_{ego}	Base “object”	Chronos tick τ_d	Formal “day” (our s)	Formal “day”
-3	0	Sub ² -quark	τ_0/φ^3	20,396	5.7 h
-2	+1	Sub-quark	τ_0/φ^2	33,002	9.2 h
-1	+2	Quark	τ_0/φ	53,398	14.8 h

0	+3	Atom (proton)	τ_0	86,400	24.0 h
+1	+4	Molecule/cell	$\tau_0\varphi$	139,798	38.8 h
+2	+5	Organism	$\tau_0\varphi^2$	226,198	62.8 h
+3	+6	Civilization	$\tau_0\varphi^3$	365,996	4.2 d

Physical octave scale: $\varphi^{9\bar{\kappa}} \approx 8.3 \times 10^{36}$. Upper “human’s” physical “day” $\approx 2.3 \times 10^{34}$ yr \approx proton lifetime!

IV.4a. The number $\varphi^9 \approx 76$ and human lifespan

$$T_{\text{life}} = \varphi^9 \approx 76 \text{ years} \quad (\text{IV.4b})$$

IV.5–IV.10. Time relations, two-scale problem, chirality, observational consequences

Universal invariant: ratio of chronos of any two adjacent levels = φ . Two-scale problem: $\varphi^9 \approx 76$ vs. $R_{\text{Universe}}/a_0 \approx 8.3 \times 10^{36}$. Resolution: physical size $L_d = R_0 \times \varphi^{N(d)}$ with amplification coefficient $\bar{\kappa} \approx 19.6$. Speed of light:

$$c_d = \frac{r_0 \cdot \varphi^d}{\tau_0 \cdot \varphi^d} = \frac{r_0}{\tau_0} = c_0 = \text{const} \quad (\text{X.8})$$

V. The Cosmological Horizon as a Level Boundary

The cosmological horizon ($\sim 4.4 \times 10^{26}$ m) is the **boundary of the coherence cluster at level $d = 9$** [7]. Our Universe’s horizon = the wall of our “proton” for the second-octave observer ($d = 9$). Expansion = growing scale of the fixed point. Dark energy = pressure of H on the cluster boundary [7, 21].

The Big Bang is the moment of loop closure $\Psi^* = \Phi(\Psi^*)$ at $d = 9$ [22]. A black hole is the deconfiguration operator $\hat{D} = \iota_{\text{limit}} : C \rightarrow H$ [22]. Hawking radiation: $T_H \propto D(\eta)|_{\text{horizon}}$.

VI. Cosmological Proportions from Toroidal Architecture

The φ -torus with $R/r = \varphi$ generates three sectors [21]:

$$Z = \frac{\pi - 3}{1 - (\pi - 3) \cdot \varphi} = 0.18367229293062 \dots \quad (\text{VI.1})$$

$$\Omega_\Lambda : \Omega_{\text{DM}} : \Omega_b = \varphi^2 : 1 : Z, \Sigma = \varphi^2 + 1 + Z = 3.80170628168052 \dots$$

Parameter	ODTOE	Planck 2018 [25]	Deviation
Ω_Λ (dark energy)	68.86%	$68.89 \pm 0.56\%$	-0.05σ
Ω_{DM} (dark matter)	26.30%	$26.07 \pm 0.20\%$	$+1.17\sigma$
Ω_b (baryonic)	4.83%	$4.90 \pm 0.06\%$	-1.14σ

All three within 1.2σ . **Zero** free parameters.

Self-referential correction: $\varepsilon x^2 + x(K + Z - \varepsilon) - Z = 0$, $\Omega_b(\text{s.r.}) = 4.856\% (-0.74\sigma)$.

Four-component model: $\Omega_\nu = (\pi - 3)^2 / \Sigma_4 = 0.52\%$.

VII. Nuclear Processes Through the Eyes of Nested Observers

VII.1. Thermonuclear synthesis: $4\text{H} \rightarrow \text{He}$ — merger of universes [10]. For $d = -100$ inhabitants, solar synthesis spans 10^{31} of their “years.”

VII.2. Collider collision: Ψ^* destroyed, $S \rightarrow 0$. Deconfinement for 10^{-23} s [10].

VII.3. Nuclear fission: ^{235}U — cascading decoherence from $d = -1$ through $d = +4$ [10].

VII.4. Annihilation: $e^- + e^+ \rightarrow 2\gamma$, $\hat{O} + \iota = 0$. The act of observation itself is annulled.

VIII. Navigation Between Levels

VIII.1. Levels are not places but coherence regimes

Levels d are recursion depths of the operator \hat{O} [1]. A human is a vertical column through recursion. “Navigation” is a shift of the awareness window.

VIII.1a. Threshold permeability between levels d

$$P(d \rightarrow d + 1 | S) = \Theta(S - S_c) \cdot [1 - \exp(-(S - S_c)/\delta S)] \quad (\text{VIII.1a})$$

where $\delta S = (\pi - 3)^2 = 0.02005$. Full information flow:

$$I(d + 1 \rightarrow d | S) = I_0 \cdot \varphi^{-1} \cdot P(S) \quad (\text{VIII.1b})$$

Threshold barriers are protective [31]. At $S < S_c + \delta S$, the φ -torus is locally destroyed, Lyapunov exponent $\lambda > 0$.

VIII.2–VIII.3. Downward and upward movement

Downward ($d \rightarrow d - 1$): degradation ($d = 3 \rightarrow 2$: loss of $\hat{O}(\hat{O})$, deep sleep, coma).
Upward ($d \rightarrow d + 1$): coherence growth ($d = 3 \rightarrow 4$: collective consciousness).

VIII.4. Natural transition mechanisms

Sleep as dimensionality oscillation:

$$d_{\text{eff}}(t) = d_0 + \Delta d \cdot f(t) \quad (\text{VIII.4a})$$

Meditation, flow state, near-death experience (NDE) [23].

VIII.5. Observer death: operator deactualization

Four phases ($F \rightarrow 0$, $E \rightarrow 0$, $\Lambda \rightarrow 0$, $\sigma \rightarrow 1$) [23]. Three hypotheses: (a) cessation; (b) transition to H [5]; (c) projection shift [1].

Coherent legacy $L(O)$ [23]: $T(A) = T_0 / (1 - S_A)^{n_{\text{read}}}$.

VIII.6. Five levels of inter-level navigation through H

Levels 1–5: Informational (quantum teleportation [15]), Correlational, Configurational, Personal ($C \rightarrow H \rightarrow C'$) [11], Inter-level ($C_{d_1} \rightarrow H \rightarrow C_{d_2}$) [11].

IX. Unified Picture: The Vertical Universe

IX.1. New cosmography

ODTOE cosmography: **vertical expansion** (into recursion depth). Infinitely up. Infinitely down. Life at every floor. The only “elevator” is coherence.

IX.2. Answer to the Fermi paradox

D-Prot. Each civilization sees a window of ~ 6 levels. “Where is everyone?” — on other floors of an infinite building.

IX.3. Limit: $S \rightarrow 1$ and the meeting

$S = 1$ is unreachable (Ashby’s law [1]). Every increase in coherence is a step toward the meeting.

IX.4. Anti-coherent clusters: destructive cooperation

$$P_{\text{destr}}(E) = 1 - \prod (1 - \sigma_i^k) \quad (\text{IX.4a})$$

$$P_{\text{destr}}(n) = 1 - (1 - \sigma^k)^n \quad (\text{IX.4b})$$

Critical number: $n_{\text{cr}} = \ln(2) / \ln(1/(1 - \sigma^k))$ [31].

IX.5. Immortality paradox at fixed dimensionality

$$N_{\text{conf}}(d) = 4\pi^2 \varphi \cdot (r_d/l_P)^2 = 63.877 \cdot (r_d/l_P)^2 \quad (\text{IX.5a})$$

$$T_{\text{sat}} = N_{\text{conf}} \cdot \tau_d \quad (\text{IX.5b})$$

$$dT/dt > 0 \text{ without degradation only if } dd/dt > 0 \quad (\text{IX.5c})$$

IX.6. Multi-layer observation

All levels are present *simultaneously* at every point. $H = \bigcup_d H_d$. One electron ($d = 0$) in a water molecule simultaneously participates in three levels [12].

IX.7. Egregore as an emergent meta-observer

At $n > n_{\text{cr}}$: emergent meta-observer with B_{meta} , A_{meta} , H_{meta} [26]. $S_{\text{meta}} \sim \prod_i S_i^{1/n}$. $T_{\text{meta}} = T_0 / (1 - S_{\text{meta}})^{n \cdot k_{\text{meta}}}$ [31].

IX.8. Observer trichotomy: spirit, soul, body

$(B, A, H) = (\text{spirit, soul, body})$. $B = \text{coherence (depth of recursion)}$. $A = \text{focus archetype (direction of observation)}$. $H_{\text{hist}} = \text{cumulative history (record of configurations)}$ [31]. At $d = 0$: proton (R) = “body,” neutron (O) = “spirit,” electron (\hat{O}) = “soul.”

X. Mathematical Appendix: Formula Verification

All computations: mpmath, dps = 55.

X.1. Fundamental constants

$$\pi = 3.14159265358979323846264338327950288419716939937511$$

$$\varphi = 1.61803398874989484820458683436563811772030917980576$$

$$(\pi - 3)^2 = 0.02004847955059918805863070019913383013068301099016$$

X.2. Proton-to-electron mass ratio

$6\pi^5 = 1836.11811$. Full four-layer self-referential formula [8]:

$$\mu = 6\pi^5 + \frac{(\pi - 3)^2\varphi}{1 - (\pi - 3)^2\varphi^2} + \frac{\varphi^4}{21600} + \frac{(\pi - 3)^2}{\mu} \quad (\text{X.2})$$

$\mu_{\text{ODTOE}} = 1836.15267304$. Experimental: 1836.15267343(11). **Nine** significant digits.

X.3. Inverse fine-structure constant

$\alpha^{-1} = \pi(4\pi^2 + \pi + 1) = 137.03630$. Six correct digits.

X.4–X.8. Cosmological proportions, Hoyle resonance, lepton mass scaling, universe scale, speed of light invariance

$Z = 0.18367\dots$, $\Omega_\Lambda = 68.86\%$, $\Omega_{\text{DM}} = 26.30\%$, $\Omega_b = 4.83\%$ [27]. Hoyle: $6(\pi - 3)/\pi = 0.27042$ (exp. 0.27049, 0.026%). Lepton masses: $\log_\varphi(m_\tau/m_e) \approx 17$, $\log_\varphi(m_\mu/m_e) \approx 11$, sum = 17. Universe scale: $\log_\varphi(R_{\text{Univ}}/a_0) = 176.66$, $\bar{\kappa} = 19.6$.

XI. Falsifiable Predictions

13 predictions including: exactly 3 generations per level [14] (confirmed); quark substructure at $E \gg 10^4$ GeV; inter-scale entanglement $S(\rho_d) \propto \varphi^{-|d-d_0|}$ [16]; normal neutrino mass hierarchy; $\Omega_\Lambda : \Omega_{\text{DM}} : \Omega_b = \varphi^2 : 1 : Z$ [25] (confirmed, $< 1.2\sigma$); D-Prot invisibility at $|\Delta d| > 6$.

XII. Demarcation and Limitations

(a) Life at all levels is a consequence of self-similarity, not an empirical fact. (b) Horizon identification is structural; quantitative calibration is needed. (c) Level-5 teleportation is the most speculative construction. (d) Post-mortem consciousness is not resolved within ODTOE. (e)–(h) Scaling, cosmological analogy, decoherence cascade, and $\kappa(d)$ nature remain open.

XIII. Open Problems

(a) Strict derivation of $SU(3) \times SU(2) \times U(1)$ from axiomatics. (b) Quantum numbers from (B, A, H) . (c) Exact masses of all 39 roles from π , φ , $(\pi - 3)^2$. (d) Quantitative link between $(\pi - 3)$ and $\eta \approx 6 \times 10^{-10}$. (e) PMNS/CKM angles from loop geometry. (f) Strict proof of life inevitability at arbitrary d . (g) Calibration of H_{ODTOE} to

$H_0 = 67.4$ km/s/Mpc. (h)–(j) Decoherence cascade, $\kappa(d)$ nature, HRV correlation. (k) **Fractional dimensionality** $d \in \mathbb{R}$ [31]. (l) **Numbers as autonomous observers: “Cosmos of Numbers.”**

XIV. Unsolved Problems of Fundamental Physics Resolvable Through ODTOE

XIV.1. Quantum gravity

Both descriptions are projections of the unified cycle Φ onto different coherence regimes S [1, 21].

XIV.2. Dark matter

$\Omega_{\text{DM}} = 1/\Sigma = 26.30\%$ from r -dynamics [7, 21].

XIV.3. Dark energy and cosmological constant

$\Omega_\Lambda = \varphi^2/\Sigma = 68.86\%$. The 120 orders-of-magnitude problem is resolved [7, 21].

XIV.4. Baryon asymmetry

$\pi - 3 \approx 0.14159$ guarantees $\hat{O} \neq \iota$ [2, 21].

XIV.5. Mass hierarchy problem

φ -scaling: each scale is set by $\varphi^{N(d)}$ automatically.

XIV.6. Strong CP problem

$\Psi^* = \Phi(\Psi^*)$ fixes $\theta_{\text{eff}} \rightarrow 0$ as a fixed-point condition.

XIV.7. Neutrino mass hierarchy

Mass $\propto (1 - S)$. Normal hierarchy predicted [21].

XIV.8. Measurement problem

Measurement = $\hat{O}(\Psi) = R$. “Collapse” is built into the axiomatics [1].

XIV.9. Arrow of time

Transcendence of π : aperiodic sequence $\{\Psi_n\}$ [14].

XIV.10. Black hole information paradox

$\hat{D} = \iota_{\text{limit}} : C \rightarrow H$ [22]. Information preserved in H .

XIV.11–XIV.15. Horizon problem, Planck-scale spacetime, proton radius, coupling unification, proton decay

Horizon problem: uniformity from unity of H [22]. Planck-scale: space is emergent. Proton radius: electron and muon probe different \hat{O}_0 channels [21]. Coupling unification: three constants = three aspects of the loop [21]. Proton decay: $T_p = T_0/(1 - S_{\text{atom}})^n$ [14].

XV. Vedic Cosmology as an Intuitive Imprint of ODT OE

Vedic yuga proportions = round(φ^k). Key coincidences:

$$T_{\text{Univ}}/\text{Kalpa} = 3.1944 \approx \pi \text{ (1.68\%)}. T_{\text{Univ}}/\text{Brahma day} = 1.5972 \approx \varphi \text{ (1.29\%)}. \quad (XV.2a)$$

$$T = 2\varphi K \left(1 - \frac{(\pi - 3)^2}{\varphi}\right) = 13.807 \times 10^9 \text{ yr (0.14\% from Planck)} \quad (XV.2b)$$

Svarog Circle: $25,920 = N_0^2 \times 3^4 \times 5$. Chertogg $\approx \varphi \times 1000$ (0.12%). $360/\varphi^2 = 137.508 \approx \alpha^{-1}$ (0.34%). Great Pyramid: $P/2h = 3.1402 \approx \pi$ (0.045%); $a/b = 1.6194 \approx \varphi$ (0.087%). Surya Siddhanta: sidereal year = 365.2563627 days (0.007 ppm). Maya: Tun = 360 = $8 \times 9 \times 5$; Baktun = $F_{12} \times 10^3$. Circle of Life = 144 = $F_{12} = 16 \times 9$. $\varphi^{27} = 439,204 \approx \text{Kali Yuga} = 432,000$ (1.67%), $27 = 3^3$ [6, 28, 29, 30].

CONFLICT OF INTEREST

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