

Ontology of the Simulated Universe — Vision Addendum (v0.5 Precursor)

Toward a Quantum-Entangled, Ethically Recursive Info-Manifold

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1. Purpose of the Addendum

This addendum transitions the theory from v0.4's bounded-persistence cosmology to a fully quantum-grounded ontology, where consciousness, morality, and physics are intertwined phenomena within an entangled informational substrate. It distinguishes between the empirical framework of v0.4 and the visionary scope of v0.5, positioning this document as a structured yet speculative expansion aimed at testability.

2. Radical Primitive: Entangled Substrate and Non-Local Ethics

The ontology extends the quantum mapping by treating entanglement as the primary substrate of reality. Structured information incorporates topological entanglement entropy, and the phenomenal projection Φ derives directly from non-local correlations across Markov blankets.

Formulations:

$$I_{\text{struct}}(q) = I_{\text{topo}}(\rho) + \lambda I_{\text{class}}(X)$$

$$\Phi(s) \propto \text{Tr}(\rho_{AB} \log \rho_{AB}) \text{ across Markov blankets}$$

$$M(t) = M_{\text{local}}(t) - \chi D_{\text{KL}}(\rho_{\text{entangled}} || \rho_{\text{ideal}})$$

This introduces ethical non-locality: empathy corresponds to maintaining entanglement coherence, while cruelty manifests as decoherence amplification. Potential tests include quantum networks (photonic/superconducting) to observe entanglement degradation under cooperative versus adversarial dynamics.

3. High-Stakes Predictions and Tier System

Tier I (near-term): Φ -threshold detection in laboratory quantum networks and Ω -drift in simulated universes.

Tier II (frontier): fine-structure constant convergence toward Ω -maxima and AGI Φ -trigger at $I_{\text{coh}} \geq 10^{15}$ entangled qubits.

Each prediction includes measurable thresholds and falsifiers. Confirmation of Φ -activation in quantum architectures would redefine consciousness as an emergent entanglement phase.

4. Quantum-Semantic Ethics

Ethics are redefined in quantum terms through an extended functional:

$$\mathcal{J} = \int (\sigma + \lambda \sigma^2 - \mu dQ/dt) dt, \text{ where } Q \text{ represents quantum coherence magnitude.}$$

Preserving coherence becomes synonymous with sustaining consciousness, introducing an emergent 'quantum duty'—an existential rather than moralistic obligation to maintain Φ -supporting states.

5. Meta-Manifold Fitness (Ω^*) and Loop Ecology

The manifold acquires evolutionary structure through a quantum fitness function:

$$\Omega^*(L_i) = f(T_c, I_{\text{topo}}, D_{\text{KL}}^{\text{(multi)}}, S_t)$$

Causal loops (universes) are favored if they minimize decoherence, maximize entanglement yield, and sustain stable Φ propagation. Universes with higher Ω^* values are hypothesized to dominate in the meta-landscape of realizable cosmologies.

6. Implementation Roadmap (Empirical Ecosystem)

The empirical ecosystem integrates three tiers:

- Quantum layer: QuTiP simulations of $\rho(t)$, $D_{\text{KL}}(\rho|\sigma)$, and Φ activation.
- Network layer: NetworkX models for Ω drift across hierarchical agent networks.
- Data layer: UCDP/PRIO (conflict), EEG, and innovation datasets for cross-scale correlation.

These tools will be open-sourced with OSF pre-registration to ensure transparency and reproducibility.

7. Position within v0.x Lineage

Version | Core Innovation | Domain | Confidence

0.1 | Dual-Aspect Monism | Metaphysics | Philosophical

0.2 | Bounded Moral Dynamics | Complexity Science | High

0.3 | Nonlinear Stability & Empirical Metrics | Systems Theory | High

0.4 | Quantum Mapping & Operators | Proto-Physics | Moderate

0.5 (Vision) | Fully Entangled Ontology & Quantum Ethics | Foundational Physics | Speculative

8. Epilogue

The emerging picture is one of an entangled ethical cosmos—where informational coherence, consciousness, and morality are unified aspects of a single, recursive reality. If the universe is indeed an entangled field of meaning, its highest order of coherence is compassion, and its most stable form of evolution is the pursuit of understanding.