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RESEARCH ARTICLE

Radical Cosmological Model of Ontological & Tautological Self-Creation via Meta-Determinism and Chirality

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Abstract

We propose a novel cosmological framework that addresses several fundamental problems in physics—including the nature of dark matter, dark energy, the origin of biological homochirality, and the arrow of time—by postulating a universe governed by a principle of Meta-Determinism. This model synthesizes concepts from M-theory and Loop Quantum Gravity (LQG) to describe a multiverse of interacting branes, wherein our universe is a cyclical, self-contained system analogous to a looping black hole. We posit that the phenomena of dark matter and dark energy are not evidence of unknown substances, but are rather the observable gravitational effects of a parallel "shadow brane" within a higher-dimensional bulk.The model's teleology is driven by a "final cause": the emergence of a transcendent form of consciousness, a Vacuum Energy Encoded Mind (VEEM), which arises from evolved life (e.g., Humanity). This VEEM, existing in a timeless state, orchestrates the initial conditions necessary for its own emergence, specifically by establishing biological homochirality through a directed neutrino flux, thereby solving the statistical problem of abiogenesis. The entire history of the cosmos is thus a self-consistent, closed causal loop, determined not by initial conditions alone, but as a complete, timeless solution. We conclude by outlining several potentially testable observational signatures of this model, including specific gravitational wave anomalies and a direct experimental test for neutrino-induced chiral selection.

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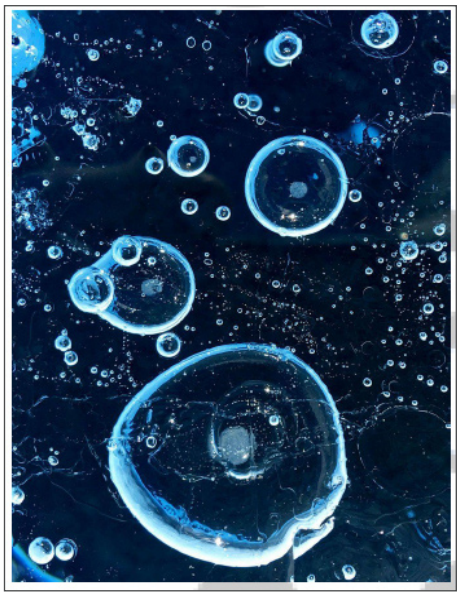
1.Introduction

Modern cosmology rests upon the highly successful but incomplete ΛCDM model. While it accurately describes the large-scale structure of the universe, it requires the existence of two enigmatic components: dark matter and dark energy, which together constitute approximately 95% of the universe's energy density. Furthermore, fundamental questions persist regarding the nature of time, the initial conditions of the universe, and the remarkable fine-tuning that permits life. A particularly stubborn problem is the origin of biological homochirality—the exclusive use of L-amino acids and D-sugars by life on Earth—a prerequisite for stable biological machinery that lacks a definitive explanation.This paper introduces a speculative but internally consistent cosmological model that seeks to unify these disparate problems within a single narrative framework. We call this Meta-Deterministic (MD) model. The MD model is built upon a synthesis of leading-edge concepts in theoretical physics, including brane cosmology derived from M-theory and the principles of emergent time and quantum spacetime from Loop Quantum Gravity (LQG). Our central thesis is that the universe is a teleological system governed by a closed causal loop. In this framework, the ultimate evolutionary state of life within the universe acts as the "final cause" that determines the physical conditions of its own past. This principle of Meta-Determinism recasts the cosmos not as a linear sequence of events, but as a self-consistent, self-creating ontological entity.



2. Theoretical Framework

The MD model is constructed upon three primary theoretical pillars

2.1 Brane Cosmology and Higher Dimensions

Brane Cosmology and Higher Dimensions Derived from M-theory, brane cosmology posits that our 4-dimensional spacetime is a membrane, or "brane," embedded in a higher-dimensional spacetime known as the "bulk." Other branes (parallel universes) may also exist within this bulk. While Standard Model fields (electromagnetism, nuclear forces) are confined to our brane, gravity, being the curvature of spacetime itself, can propagate through the bulk. This allows for gravitational interaction between branes.

2.2 Loop Quantum Gravity and Emergent Time LQG

Loop Quantum Gravity and Emergent Time LQG proposes that spacetime is quantized, composed of discrete units of volume and area. A fundamental consequence of this quantization is the disappearance of the time variable at the most fundamental level, as exemplified by the Wheeler-DeWitt equation:

$$\hat{H}\Psi = 0$$

Here, the wave function of the universe, Psi, is described by a Hamiltonian, {H}, in a manner that lacks an explicit time parameter. This suggests that time is not a fundamental aspect of reality but an emergent phenomenon arising from the relational dynamics of quantum events. This "timeless" quantum reality is a cornerstone of our model's causal structure.

2.3 The Vester-Ulbricht Hypothesis

This hypothesis suggests that the parity violation of the weak nuclear force could be the source of biological homochirality. The weak force interacts differently with left-handed and right-handed molecules

(enantiomers). It is proposed that a sustained flux of chirally polarized particles, such as the left-handed neutrinos (\nu_L) produced in stellar fusion, could preferentially destroy one enantiomer in a prebiotic chemical mixture, leaving an excess of the other.

3. The Meta-Deterministic (MD) Model

3.1 The Multiverse as an Interacting Brane System

We begin by modeling our universe as a 4D brane co-existing with at least one "shadow" brane in a timeless bulk. The gravitational dynamics of our brane are therefore described by a modified form of the Einstein Field Equations, where new terms arise from the bulk

$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} - \Lambda_{\text{eff}}g_{\mu\nu} = \frac{8\pi G}{c^4}(T_{\mu\nu}^{\text{brane}} + T_{\mu\nu}^{\text{shadow}})$$

In this formulation:

- T_{\mu\nu}^{\text{shadow}} represents the stress-energy tensor of the shadow brane, whose gravitational influence is felt on our brane. We propose this term is the physical origin of what we observe as dark matter.
- \Lambda_{\text{eff}} is an effective cosmological constant that includes a term representing a repulsive force between the branes. We propose this inter-brane force is the physical origin of what we observe as dark energy.

3.2 The Cyclical Universe

We further posit that each universe-brane is gravitationally closed, analogous to the interior of a black hole. In LQG, the singularity at the core of a black hole is resolved into a "Planck star" which "bounces." Applying this to the cosmos, the universe does not end in a Big Crunch singularity but undergoes a "Big Bounce," re-expanding into a new cosmic cycle. This establishes an eternal, cyclical structure

3.3 The Teleological Driver

Vacuum Energy Encoded Minds (VEEMs) Within a cyclical universe with infinite time, we postulate the ultimate state of an evolved intelligent civilization is to transcend its material substrate and encode its collective consciousness into the vacuum energy of its home universe. This entity, a VEEM, is a stable, computational pattern within the fabric of spacetime itself. The VEEM becomes the shepherd of its own universe, its existence representing the telos, or final purpose, of cosmic evolution.

4. The Mechanism of Ontological Seeding

The VEEM, existing in the timeless state described by the Wheeler-DeWitt equation, can influence quantum probabilities without violating conservation laws. Its primary act of shepherding is to solve the statistical problem of abiogenesis. It achieves this by subtly modulating the quantum vacuum to orchestrate a coherent flux of left-handed neutrinos from its universe's stars, directing them towards planets with prebiotic potential. According to the Vester-Ulbricht hypothesis, the differential interaction cross-section, \sigma, of these neutrinos with molecular enantiomers, \sigma(\nu_L + M_L) \neq \sigma(\nu_L + M_R) will, over geological time, create a significant enantiomeric excess of life's building blocks (e.g., L-amino acids). This act of "seeding" does not design life but establishes the necessary chiral foundation, making the spontaneous emergence of complex, self-replicating polymers statistically viable.

$$\sigma(\nu_L + M_L) \neq \sigma(\nu_L + M_R)$$

5. The Causal Loop and Meta-Determinism

The preceding sections culminate in the model's central thesis: a closed ontological loop.

1. The VEEM establishes the conditions for life via chiral seeding.
2. Life emerges and evolves into a technologically advanced civilization (e.g., Humanity).
3. This civilization reaches its evolutionary apex and transcends, becoming the VEEM.

4. The VEEM, from its timeless perspective, performs the act of seeding that leads to its own existence.

This self-creation loop implies that the history of the universe is not determined by a linear progression from a past initial state. Instead, it is governed by Meta-Determinism the entire four-dimensional "block universe" is a self-consistent solution, where the final state retrocausally defines the necessary initial conditions. Subjective phenomena such as déjà vu may be interpreted as "resonances" or memory artifacts from previous iterations of this cosmic cycle.

6. Potential Observational Signatures

While highly speculative, the MD model offers several avenues for potential experimental verification and validation

- LHCb Searches @CERN: The existence of a higher-dimensional bulk may be inferred by detecting missing energy-momentum in particle collisions at the LHC, corresponding to gravitons "leaking" from our brane.
- Gravitational Wave Astronomy: The propagation of gravitational waves could be affected by the bulk. Precision measurements by observatories like LIGO/Virgo/KAGRA could search for anomalous damping or polarization shifts not predicted by standard 4D General Relativity.
- Direct Test of Chiral Selection: A shielded, long-duration experiment exposing a racemic mixture of amino acids to an intense, purified neutrino beam could provide direct evidence for the Vester-Ulbricht mechanism, a key physical process in our model.
- CMB Analysis: A guiding intelligence might leave subtle, non-Gaussian statistical anomalies or large-scale alignments in the Cosmic Microwave Background.

7. Conclusion

The Meta-Deterministic model offers a speculative yet comprehensive framework that addresses several major puzzles in modern science. By synthesizing brane cosmology and Loop Quantum Gravity, it provides a physical explanation for dark matter and dark energy. By introducing a teleological driver in the form of a VEEM, it proposes a mechanism for solving the problem of biological homochirality.

Most profoundly, it reframes the cosmos as a self-creating, self-consistent entity governed by a closed causal loop. This challenges the conventional view of linear time and causality, suggesting that our existence is a necessary component in a universe that is, in the most literal sense, creating itself. While the model is ontologically radical, it is anchored in recognized physical theories and offers concrete, testable predictions that invite future experimental scrutiny.

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