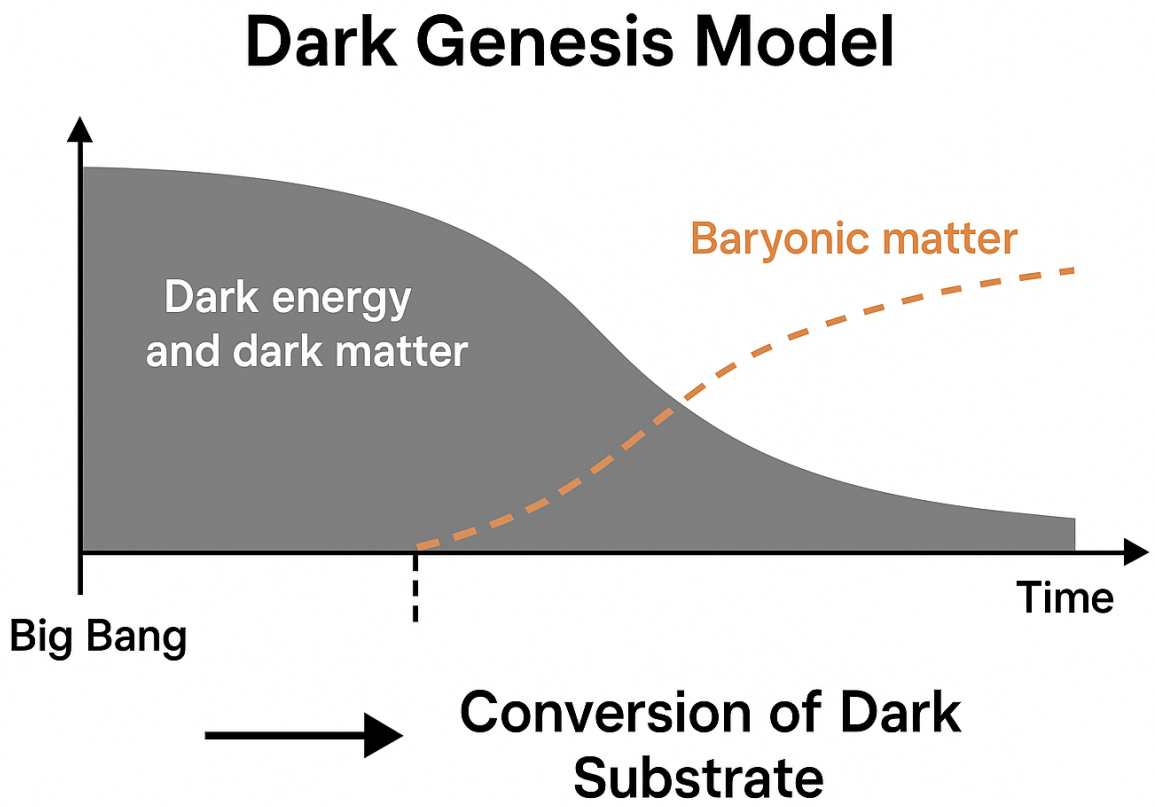
Dark Genesis: A Foundational Framework of Cosmological Evolution

Author: Aaryamun



Dark Genesis: A Foundational Framework of Cosmological Evolution via Dark Substrate Conversion

Author: Aaryamun (Originator of the Aaryamun Law)

Abstract:

The Dark Genesis framework proposes a paradigm shift in cosmology, treating dark matter and dark energy not as post-Big Bang phenomena, but as the primordial substrate from which baryonic matter and energy emerge. According to this theory, the Big Bang was a localized quantum instability or catalytic event that converted a small portion (~5%) of the dark substrate into baryonic matter, initiating the visible universe. This

paper formalizes the theoretical foundation, observational correlations, quantum field associations, and introduces the Aaryamun Law to model the substrate-to-baryon conversion dynamics.

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1. Introduction

Standard Lambda-CDM cosmology postulates a universe dominated by dark energy (68%) and dark matter (27%), with baryonic matter constituting only about 5%. While observationally successful, it does not explain the origin or purpose of these dark components. The Dark Genesis framework addresses this gap by suggesting dark matter and energy are the ancient, pre-Big Bang state of the universe.

2. Conceptual Foundation

- Primordial Dark Substrate: The universe began as a quantum vacuum filled with dark energy and matter fields.
- Catalytic Conversion: A localized instability-interpreted as the Big Bang-triggered the conversion of a portion of the dark substrate into baryonic matter and radiation.
- Ongoing Conversion: The conversion is hypothesized to continue at extremely low rates, potentially measurable in cosmic voids or early universe anomalies.

3. The Aaryamun Law

We define the substrate conversion rate as:

$$\frac{d\rho_b}{dt} = -\frac{d\rho_d}{dt} = \alpha \cdot \rho_d^n \cdot f(t, T, \Phi)$$

Where:

- ρ_b = baryonic energy density
- ρ_d = dark substrate density (dark matter + energy)

- alpha = conversion constant

- n = field exponent depending on quantum fluctuation strength

- f(t, T, Phi) = function of time, temperature, and conversion potential field Phi

4. Cosmological Evidence and Observations

- CMB Anisotropies: Represent initial baryonic matter conversion hotspots.

- Boötes Void and Other Cosmic Voids: Interpreted as regions of low conversion, possibly containing unconverted dark substrate.

- Accelerated Expansion: Fueled by the presence of remaining unconverted dark energy.

- Baryon-Dark Matter Ratio: Viewed not as fixed, but evolving as conversion proceeds.

- Large-Scale Structure: Filaments represent areas of high conversion; voids remain dominated by dark substrate.

- Gravitational Lensing in Voids: Can indicate unseen mass (unconverted substrate).

5. Quantum Field Interpretation

- Zero-Point Energy: Interpreted as the quantum baseline of the dark substrate-residual energy from which matter can emerge.

- Quantum Vacuum: Not empty but filled with energy and potential for conversion.

- Phase Transition Model: Analogous to inflationary scalar field decay; baryonic matter arises from a symmetry-breaking event.

- Casimir Effect: Demonstrates the energy of vacuum, supporting the reality of the dark substrate.

6. Predictions and Tests

- Slight measurable decrease in dark matter density over time due to slow ongoing conversion.

- Increase in baryonic density in newer regions, especially near void boundaries.

- Gradual slowing or modification of the universe's expansion rate as dark energy depletes.

- Potential for dark-to-baryon conversion traces in early galaxy mass functions.

- Detection of non-visible mass within voids via gravitational lensing or motion studies.

7. Simulated Visualization and Diagrams

Figures include:

- Diagram of dark substrate conversion field

- Spacetime evolution from pure dark substrate to baryonic-rich regions

- Map overlay showing voids as low-conversion zones and filaments as high-conversion pathways

- Quantum field representation showing zero-point fluctuations leading to particle genesis

8. Conclusion

Dark Genesis offers a coherent and testable cosmological model rooted in quantum field theory and astrophysical observations. The Aaryamun Law formalizes the dynamics of matter genesis and provides a framework for further simulation and data comparison. This theory provides fresh insights into long-standing puzzles such as the cosmic voids, the true nature of vacuum energy, and the observed matter imbalance.

References:

- Planck Collaboration (2018)

- WMAP Mission Data

- Casimir Effect Experiments

- Large-Scale Structure Surveys (e.g., SDSS, DES)

- Quantum Field Theory textbooks (e.g., Peskin & Schroeder)

- Baryon Acoustic Oscillation Studies

- Gravitational Lensing Surveys in Cosmic Voids

Submitted for peer review.