Organizational Emergence Cosmology

DEBA Framework (Deterministic Emergence By Actualization)

Organizational cosmology without pre-existing geometry

Michel Debailleul
Geophysicist, Belgium
michel.debailleul@yahoo.fr

Version: December 2025

Abstract

We propose DEBA (Deterministic Emergence By Actualization), a novel cosmological paradigm that rejects the pre-existence of geometry, time, and causality. In this framework, the observable universe emerges as a stabilized organizational coherence pattern within an atemporal primordial Void $(\mathcal{C}, \mu)$. The Big Bang is not an absolute origin but the local stabilization of a portion of a global organizational flash. Dark matter is identified with the local coherence score $s(x)$, while dark energy represents a compensation mechanism maintaining coherence against expansion. This framework naturally unifies dark matter and dark energy, resolves the cosmic coincidence problem, and explains cosmic microwave background anomalies (Cold Spot, Axis of Evil). DEBA predicts that gravitational waves are not lensed by $s(x)$, unlike light – a decisive falsifiable prediction. The universe ends through organizational vaporization without rebirth cycle.

Keywords: organizational cosmology, emergence, dark matter, dark energy, primordial Void, organizational flash, coherence

Contents

1. Introduction: A New Cosmological Paradigm

DEBA cosmology proposes a radical break from current models by rejecting the pre-existence of geometry, time, and causality. Instead of considering the universe as evolving in a pre-existing spacetime, DEBA postulates that all observable physics emerges from an atemporal primordial Void, a space of abstract configurations where only organizational coherence exists.

In this framework, our universe was not born from a Big Bang in the traditional sense, but results from the stabilization of a portion of an organizational flash – a coherence condensation event in the primordial Void. What we call physical constants, dark matter, and dark energy are merely manifestations of this organizational coherence.

Problems solved by DEBA:

- The cosmic coincidence (why $\rho_{\text{matter}} \approx \rho_\Lambda$ today?)
- The nature of dark matter (undetected particle)
- The nature of dark energy (mysterious cosmological constant)
- CMB anomalies (Cold Spot, Axis of Evil)
- The H_0 tension
- Fine-tuning of physical constants

2. Fundamental Ontology: Organizational Monism

2.1. The Primordial Void: Sole Ontological Reality

Central principle: Only the primordial Void truly exists. Everything we call "physical reality" is merely an emergent organizational pattern in this Void.

The primordial Void is defined by a configuration space $(\mathcal{C}, \mu)$ where:

- $\mathcal{C}$ = set (discrete or continuous) of potential configurations
- μ = finite measure assigning a statistical weight to each configuration: $\mu(\mathcal{C}) < \infty$

Absence of pre-existing structure:

- No spatial geometry
- No metric
- No time
- No causality

2.2. Parameter τ: Organizational Order, Not Temporality

The parameter τ appearing in DEBA dynamics is **not a time**. It is an **organizational order parameter** that measures progression toward coherence.

Physical time (what we experience) emerges **only inside a stabilized universe-bubble**. It is an internal structure of the coherence pattern.

3. The Organizational Flash and the Emergence of Universes

3.1. Flash: Organizational Phase Transition

The flash is a coherence condensation event that propagates through the configuration space $\mathcal{C}$. It is an **organizational beam** that sweeps through $\mathcal{C}$ and generates universe-bubbles through local stabilization.

3.2. Big Bang: Stabilized Portion of the Flash

Crucial point: The Big Bang is not the origin of the universe. It is the **local stabilization of a portion of the flash**.

Each universe-bubble captures a specific portion of the flash, denoted $s(x)$, which determines the internal physical constants (G, c, Λ).

4. Mathematical Architecture of the DEBA Framework

4.1. Fundamental Structures

4.1.1. Organizational Field Φ

$\Phi : \mathcal{C} \to \mathbb{R}$ quantifies the organizational amplitude of each configuration.

4.1.2. Correlation Kernel K

$K : \mathcal{C} \times \mathcal{C} \to \mathbb{R}$ encodes the resonance between configurations. Symmetric: $K(x, y) = K(y, x)$.

4.2. Functional Langevin Equation

The dynamics of the field Φ is governed by the stochastic equation:

$$d\Phi(x) = -C \int K(x, y) \frac{\delta V[\Phi]}{\delta \Phi(y)} d\mu(y)\, d\tau + \sqrt{2D(x)}\, dW_\tau(x) \tag{1}$$

where:

- $\tau \in \mathbb{R}^+$ = organizational order parameter
- $V[\Phi]$ = functional organizational potential
- $C > 0$ = coupling intensity
- $D(x) > 0$ = noise amplitude
- $W_\tau(x)$ = Wiener process

4.3. Bistable Potential

The organizational potential V has two attractors:

$$V(Q) = \frac{\lambda}{4}(Q^2 - v^2)^2 + \varepsilon Q \tag{2}$$

where $Q \approx$ global order parameter. The two attractors are:

- $Q \approx -v$: weakly coherent regime (pre-flash)
- $Q \approx +v$: strongly coherent regime (post-flash)

4.4. Coherence Score $s(x)$

The local coherence score is defined by:

$$s(x) = \sigma\left(\int K(x,y)\Phi(y)\,d\mu(y)\right) \tag{3}$$

where $\sigma(z) = 1/(1+e^{-z})$ is a sigmoid function. **This score is dark matter.**

5. Unification: Dark Matter and Dark Energy

5.1. $s(x)$: The Solution to the Dark Matter Enigma

Dark matter is not a particle. It is the **local coherence score** $s(x)$.

The stabilizing coherence density is:

$$\rho_{\text{stab}}(x) = \alpha \cdot s(x)^2 \cdot |\nabla\Phi_{\text{bary}}(x)| \tag{4}$$

This density concentrates around baryonic structures and dilutes as a^{-3} with expansion.

5.2. Dark Energy: Active Compensation

Dark energy is the compensation mechanism that maintains total coherence against expansion:

$$\rho_{\text{adapt}}(\tau) = \beta \cdot \left(\frac{\dot{a}}{a}\right)^2 - \rho_{\text{stab}}^{\text{total}}(\tau) \tag{5}$$

5.3. Organizational Equilibrium Constraint

The total coherence of the bubble is conserved:

$$\rho_{\text{total}} = \rho_{\text{stab}} + \rho_{\text{adapt}} = \mathcal{C}_{\text{bubble}} = \text{constant} \tag{6}$$

This equation **replaces the Friedmann equation** as the fundamental organizing principle.

5.4. Resolution of the Cosmic Coincidence

Problem in ΛCDM: Why $\rho_{\text{matter}} \approx \rho_\Lambda$ today? Unexplained coincidence.

DEBA solution: Natural self-regulation. Both are manifestations of the same coherence. When $\rho_{\text{stab}} \downarrow$, $\rho_{\text{adapt}} \uparrow$ automatically. The ratio emerges from organizational equilibrium:

$$\frac{\rho_{\text{stab}}}{\rho_{\text{adapt}}} = \frac{\alpha}{\beta - \alpha} \approx 0.40 \tag{7}$$

in agreement with observations ($\Omega_{\text{DM}} \approx 0.27$, $\Omega_\Lambda \approx 0.68$, ratio ≈ 0.40).

6. Ultimate End: Vaporization of the Universe

6.1. Compensation Limit

The compensation by ρ_{adapt} has a limit. When $s(x) < s_{\min}$ everywhere, the bubble loses its global coherence and vaporizes.

6.2. No Cosmic Cycle

Fundamental point: There is **no cycle**. The universe disappears definitively into the primordial Void.

7. Observable Signatures and Testable Predictions

7.1. The Cold Spot: Imprint of Recombination

Observable: Anomalously cold region ($\sim$70 μK) in the CMB.

DEBA interpretation: Pocket of local sub-coherence frozen during recombination ($t \approx$ 380,000 years, $T \approx 3000$ K). During this epoch, $s(x_{\text{CS}}) < \langle s \rangle$, creating a thermal deficit diluted by expansion.

Quantitative relation:

$$\frac{\Delta T}{T} \approx \frac{\Delta s}{\langle s \rangle} \approx -2.6 \times 10^{-5} \tag{8}$$

Testable predictions:

- Temporal fixity: No evolution between WMAP and Planck
- No matter counterpart: The deficit is organizational
- Polarization signature: Asymmetric pattern in E/B

7.2. The Axis of Evil: Influence of Neighboring Bubbles

Observable: Unexplained alignment of low multipoles ($\ell = 2, 3$) of the CMB.

DEBA interpretation: Preferred direction imposed by the influence of contemporary universe-bubbles during stabilization. These bubbles oriented our coherence via $K(x, y)$ and then moved away in $\mathcal{C}$.

Testable prediction: Directional correlation between Axis of Evil, Cold Spot, hemispheric asymmetry, and primordial gravitational wave background anisotropy.

7.3. H_0 Tension: Local Variation

Observable: $\sim 5\sigma$ disagreement: $H_0^{\text{global}} \approx 67.4$ km/s/Mpc (CMB) vs $H_0^{\text{local}} \approx 73$ km/s/Mpc (supernovae).

DEBA interpretation: Local coherence pocket where $\delta s/s \approx 9\%$, explaining $\Delta H_0/H_0 \approx 9\%$.

7.4. Decisive Test: Gravitational Waves

Unique and falsifiable prediction:

If dark matter is organizational coherence (non-material):

- In ΛCDM: Gravitational waves are lensed by dark matter
- In DEBA: Gravitational waves are NOT lensed by $s(x)$

Test with LIGO/Virgo/KAGRA: Observe GW lensing vs light. If difference $\rightarrow$ DEBA signature.

8. Methodology and Research Program

8.1. Theoretical Approach

DEBA relies on:

- Stochastic process theory: Functional Langevin equation

- Large deviation theory: Freidlin-Wentzell, instantons
- Abstract measure theory: $(\mathcal{C}, \mu)$ without pre-existing topology
- Dynamical systems: Attractors, bifurcations, stability

8.2. Necessary Developments

8.2.1. Numerical Simulations

- Toy-model: Finite space $\mathcal{C}$ (10^4 configurations)
- Stochastic integration of equation (1)
- Demonstration of stable bubble formation
- Verification that $s(x) \to$ physical constants

8.2.2. Quantitative Calculations

- Explicit derivation: $s(x) \to G_{\text{eff}}, c_{\text{eff}}, \Lambda_{\text{eff}}$
- Cold Spot calculation: $\Delta s \to \Delta T/T$
- Relation $s(x) \leftrightarrow H_0$ for tension
- CMB power spectrum from coherence pockets

8.2.3. Vaporization Program

If DEBA is validated, develop code calculating the evolution of $\rho_{\text{stab}}(t)$, $\rho_{\text{adapt}}(t)$, and the vaporization date ($s < s_{\min}$).

8.3. Observational Missions

Required data:

- LiteBIRD: High-precision CMB polarization (Cold Spot)
- LISA: Gravitational waves (decisive lensing test)
- Euclid: Large-scale structures (directional correlations)
- LIGO/Virgo/KAGRA: Gravitational lensing

9. Falsification Criteria

DEBA would be falsified if:

1. **The Cold Spot evolves temporally.** DEBA predicts: absolute fixity. If evolution detected $\to$ DEBA false.
2. **Gravitational waves are lensed identically to light.** DEBA predicts: difference. If identical $\to$ material DM.
3. **No correlation between CMB anomalies.** DEBA predicts: directional correlations. If independent $\to$ no unique flash.

4. **The ratio $\Omega_{\mathbf{DM}}/\Omega_\Lambda$ varies randomly.** DEBA predicts: correlated with $s(x)$. If random $\rightarrow$ no equilibrium.

5. **Constants do not vary locally.** DEBA predicts: variations $\approx \delta s/s$. If perfectly constant $\rightarrow$ no pockets.

10. Conclusion: Status and Vision of DEBA

10.1. Strengths

- Clear ontology: Radical organizational monism
- Elegant unification: DM and DE = organizational coherence
- Natural explanations: Cold Spot, H_0, Axis of Evil, cosmic coincidence
- Falsifiable: Precise testable predictions (GW, Cold Spot)
- Parsimony: No pre-existing geometry, no ad hoc inflation

10.2. Current Limitations

- Quantitative calculations: Few precise numerical predictions
- Formalism: Rigorous definition of μ without topology
- Quantum mechanics: How does QM emerge from DEBA?
- Simulations: Computational feasibility not demonstrated

10.3. Final Vision

DEBA proposes a radically new vision:

- Universe = organizational coherence pattern
- Big Bang = stabilization of a portion of the flash
- Dark matter = coherence score $s(x)$
- Dark energy = organizational compensation
- End = vaporization without cycle

> *"Physics is not the framework of the universe, it emerges from it. What we call 'physical reality' is merely the internal description of an organizational coherence pattern in an atemporal primordial Void."*
>
> — Fundamental principle of DEBA

Acknowledgments

I thank anonymous contributors for their constructive discussions during the development of this theoretical framework.

References

[1] Planck Collaboration (2020). Planck 2018 results. VI. Cosmological parameters. A&A 641, A6.

[2] Riess et al. (2022). A Comprehensive Measurement of the Local Value of the Hubble Constant. ApJ 934, L7.

[3] Cruz et al. (2005). Detection of a non-Gaussian spot in WMAP. MNRAS 356, 29.

[4] Schwarz et al. (2016). CMB Anomalies after Planck. Classical and Quantum Gravity 33, 184001.

[5] LIGO Scientific Collaboration (2016). Observation of Gravitational Waves. Phys. Rev. Lett. 116, 061102.

[6] Freidlin, M.I. & Wentzell, A.D. (2012). Random Perturbations of Dynamical Systems. Springer.