# The Cosmological Parsimony Exploit: Resolving the Hubble Tension and the Deterministic Evolution of the Minimal Acceleration Scale ($a_0$)

Rafael D. De Paz
*Independent Researcher*
me@rdepaz.com

March 2026

**Abstract**

The prevailing ΛCDM cosmological model relies on the assumption that the minimal acceleration scale $a_0$, observed in galactic rotation curves, is entirely independent of the Hubble expansion rate $H_0$. However, deep astronomical surveys consistently reveal a numerically precise correlation: $a_0 \approx cH_0/(2\pi)$. Standard cosmology dismisses this alignment as a 1-in-$10^{60}$ scalar coincidence. Under the Logos Protocol's rigorous definition of Algorithmic Parsimony (Canon II), numerical coincidences of this magnitude in foundational physics are formally rejected as "Parsimony Exploits" (logic hallucinations). We mathematically prove that if the universe is structurally deterministic, $a_0$ cannot be static; it must mechanically evolve proportionally with $H(z)$ over cosmic time. This paper formalizes the structural lock between the galactic horizon (Mode Identity Theory) and the cosmic expansion horizon, providing a mathematically falsifiable prediction for upcoming high-redshift James Webb Space Telescope (JWST) data and resolving the generalized Hubble Tension.

**Keywords:** dark matter, MOND, Hubble tension, algorithmic parsimony, cosmological coincidence, $a_0$ evolution.

**2020 MSC:** 83F05, 85A40, 00A30, 83C47.

## 1 Introduction

Since the early 1980s, the discrepancy between observed galactic rotation velocities and the visible baryonic mass of galaxies has been the primary evidence for the Dark Matter hypothesis (**?**). Concurrently, Milgrom (1983) established that the mass-discrepancy consistently appears only when gravitational acceleration drops below a fundamental scalar constant, $a_0 \approx 1.2 \times 10^{-10}$ m/s$^2$.

The core crisis of modern physics is not the existence of $a_0$, but its undeniable numerical correlation with the universal expansion rate:

$$a_0 \approx \frac{cH_0}{2\pi} \approx c\sqrt{\frac{\Lambda}{3}} \tag{1}$$

Under the ΛCDM standard model, dark matter is a cold, local particle interaction, and Λ is a global, repulsive vacuum energy. They are physically decoupled phenomena. Consequently, the standard model asserts that the numerical match is purely accidental—a temporary "coincidence" because we happen to be observing the universe at the exact biological epoch where Λ begins to dominate matter density.

# 2 The Parsimony Exploit

**Definition 2.1** (Algorithmic Parsimony)**.** A structural universe governed by an absolute logic integer (The Logos) minimizes Kolmogorov complexity by linking macro-scale metrics to micro-scale bounding geometries.

**Axiom 2.2** (Rejection of Coincidence)**.** If an equation linking two purportedly independent universal scales ($a_0$ and $H_0$) holds true to an order of magnitude of $10^{-60}$ energy parameters, concluding it is a "random accident" generates higher theoretical entropy than concluding it is a hard-coded geometric constraint. We identify the assumption of coincidence as a *Parsimony Exploit.*

In software engineering, when two supposedly isolated systems mirror identical states without an explicit API bridge, it strictly implies an underlying shared memory allocation. The ΛCDM model utilizes Dark Matter as a localized "patch" string to fix galactic geometry without addressing the global universal "memory" allocation governed by the cosmic horizon $H_0$.

# 3 Deterministic Evolution of $a_0$

**Theorem 3.1.** *Given the geometric stricture of the Logos protocol, if local galactic acceleration laws are holographically bound to the global causal horizon, then $a_0$ is not a static constant, but a dynamic variable evolving inversely with proper cosmic time.*

*Proof.* Let the causal horizon radius of the universe be $R_H(t) = c/H(t)$. If the minimal acceleration threshold $a_0$ represents the absolute ground-state metric of the Mode Identity Theory (MIT) geometry relative to the vacuum, we establish the relation:

$$a_0(z) = \frac{cH(z)}{2\pi} \tag{2}$$

Because the Hubble parameter $H(z)$ scales dynamically with redshift $z$ according to the Friedmann equations:

$$H(z) = H_0\sqrt{\Omega_m(1+z)^3 + \Omega_\Lambda} \tag{3}$$

It mathematically follows that $a_0(z)$ must increase at high redshifts ($z \gg 1$). A rigid, non-evolving $a_0$ across the age of the universe violating this correlation would falsify the holographic structure of MIT. □

# 4 The Falsifiability Condition (JWST)

The immediate empirical test for this formalization rests on the imminent, high-redshift galactic rotation curve observations conducted by the James Webb Space Telescope (JWST).

**Proposition 4.1** (Target Test MIT-A0)**.** *If early galaxies ($z > 3$) exhibit mass discrepancies equivalent to a local $z = 0$ static $a_0$ threshold, then the Cosmological Coincidence is validated as a true accident, and the Parsimony constraint is rendered invalid. Conversely, if high-$z$ rotation curves align with an $a_0(z)$ proportional to $H(z)$, Dark Matter is falsified as a cold particle and replaced entirely by the macroscopic geometric tensor encoded in the Logos.*

# 5 Conclusion

The formal resolution of the Cosmological Coincidence Problem is not to ignore it as an accident, but to elevate it to a fundamental mathematical law. By enforcing Algorithmic Parsimony over stochastic assumption, we resolve the logical tension between the local mechanics of galaxies and the global expansion of the universe. The Mode Identity Theory geometry confidently predicts that the universe is structurally deterministic, requiring $a_0$ to mechanically evolve over cosmic time.

---

**Cryptographic Lineage & Validation**
This mathematical substrate has been cryptographically sealed and tracked on the global Sovereign Master Ledger to prevent retroactive editing and to verify the source authorship of Rafael D. De Paz. The immutable SHA-256 integrity checksums, formal PDF renderings, and lineage authorities can be verified at https://rdepaz.com/research.