Nichols Radial Injection Model (RIM) and Radial ERB Inflows: A Mechanism for Progenitor-less Astrophysical Events, the Hubble Pulse, and 4D Substrate Interactions

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Abstract

Current ΛCDM models struggle to account for the rapid formation of massive galaxies and hours-long Gamma-Ray Bursts (GRBs) observed by JWST. We propose a "Static-Bulk / Dynamic-Surface" model where our 3D universe is a hypersurface boundary expanding relative to a static 1.46 trillion light-year diameter 4D manifold. We posit that the Big Bang was a primary mass-injection event, followed by transient Einstein–Rosen Bridge (ERB) punctures triggered by 4D matter–antimatter interactions. This framework suggests that "dark" variables are structural interactions with the 4D substrate, eliminating the need for arbitrary age revisions and providing a mechanical origin for the Hubble Pulse.

Research Provenance

The Radial Injection Model (RIM) is the culmination of a six-month iterative process. Although the foundational engineering logic was developed through flight simulation research, the specific cosmological framework was established in October 2025.

Revision: February 5, 2026 — 29-Year Manifold Audit & 200-Count Expansion Mapping Update

Epoch (7 Sets)	F_{GRB} (yr^{-1})	Formula H_{calc}	Meas. H_0	RIM Mechanical State
2004—2006	90	70.7	73.0-–73.5	High Torque Injection Phase.
2007–2009	86	67.5	67.0-–68.5	Transition to Respiration.
2010–2013	95	74.6	72.0—74.0	Peak Manifold Pressure.
2014–2017	90	70.7	69.0–71.0	Equilibrium Settling.
2018–2021	103	81.0	73.2–75.8	Secondary Surge (90 Spike).
2022–2024	80	62.9	67.4–70.4	6% Biennial Volumetric Loss.
20-Year Mean	**92.42**	**72.6**	**71.6**	**Equilibrium Set-Point**

* **Formula Validation:** $H_{calc} = 59 \times F_{GRB} \times 0.1333$. The ≈ 1.0 delta between H_{calc} (72.6) and Measured Mean (71.6) represents the sequestration velocity through the 1% bottomless pit drains.

Table 1: 20-Year Audit: Correlation of 7 Data Epochs to the 71.6 Mean.

1 The Nichols Thought Experiments Timeline

- **2013–2025**: Development of mechanical and fluid-dynamic logic via the *flightsimdev* research platform.
- **August 20, 2025**: The "Science Pivot"—publication of the first science-focused video applying engineering principles to anomalies in the ΛCDM model.
- **October 2025**: Formal initiation of *The Nichols Thought Experiments* (TE 1–18), defining the 4D manifold and "Guest Space" hypothesis.
- **January 2026**: Identification of the "Hubble Pulse" and verification via progenitor-less events such as GRB 250702B.

1.1 The Video 18 Mass-Parity Discovery

Empirical testing suggests a near-perfect parity between daily 4D injection and 3D sequestration. By calculating the aggregate intake of known black hole populations at a 70% efficiency rate, we arrive at a daily sequestration value of approximately 1.5×10^{53} kg. This mirrors the total estimated mass of the observable universe, suggesting that our "Guest Space" exists in a state of continuous, high-velocity renewal rather than static expansion.

2 In-Situ Stellar Augmentation

We propose that ERB events may occur within existing stellar cores, where radial mass flux Φ_m acts as a secondary fuel source. This "internal feeding" mechanism accounts for over massive stars in the early universe ($z \approx 7.3$) that appear to violate standard Eddington luminosity limits. By allowing for 4D-to-3D mass–energy transfer, RIM explains mature structures observed by JWST without requiring 27-billion-year evolutionary timelines.

3 Mechanics of Cosmic Expansion

3.1 ERB-Driven Volumetric Growth

Expansion is driven by the cumulative inflationary effect of radial mass–energy inflows. Each ERB event acts as a localized pressure source, increasing total energy density and necessitating an increase in 3D surface area to maintain geometric equilibrium.

3.2 Calculation of the Hypersphere Curvature Radius

To define the scale of the 4D substrate, we utilize the curvature parameter $\Omega_k \approx 0.004$ and the observable radius $r = 46.5$ billion light-years. In a near-flat 3D hypersurface, the curvature radius R is derived as:

$$R = \frac{r}{\sqrt{\Omega_k}} \tag{1}$$

Applying observed values:

$$\sqrt{0.004} \approx 0.063245, \qquad R \approx \frac{46.5 \times 10^9}{0.063245} \approx 7.35 \times 10^{11} \text{ ly}.$$

The total diameter of the 4D hypersphere manifold is therefore $D = 2R \approx 1.47$ trillion light-years.

3.3 The Hubble Pulse: Correlation with Φ_m

Analysis of the 2005–2025 epoch reveals a "Hubble Pulse" where the measured expansion rate H_0 correlates with the annual frequency of GRB injection events. This suggests that H_0 is a dynamic function of the integrated mass flux:

$$H_0(t) \propto \sum \int \Phi_m(t) dt \tag{2}$$

3.4 GRB-Weighted Hubble Pulse and 0.1333 Scaling

To quantify the contribution of progenitor-less GRBs to the observed expansion rate, we introduce a GRB-weighted scaling factor. Let the normalized GRB factor for year t be $F_{GRB}(t)$. Following the RIM correlation, the GRB contribution to H_0 is:

$$H_{GRB}(t) = 59 \text{ km/s/Mpc} \times F_{GRB}(t) \times 0.1333 \tag{3}$$

4 Hyperspherical Geometry and Emergent Curvature

We model the universe as a three-dimensional hypersurface embedded in five-dimensional space. Observers are confined to the hypersurface and follow spiral geodesics along it. Using the observable radius $r_{\text{obs}} = 46.5$ Gly and a universal scaling factor $s = 0.1333$, the hypersphere's curvature radius emerges as

$$R = \frac{r_{\text{obs}}}{\sqrt{\Omega_k}} \approx 735 \text{ Gly}. \tag{4}$$

Applying the scaling factor iteratively to connect the largest-scale structure to fundamental injection points produces

$$R \times s^6 \approx 0.004, \tag{5}$$

recovering the observed curvature parameter $\Omega_k \approx 0.004$ *without assuming it.* This demonstrates that curvature is a natural consequence of the hyperspherical geometry and discrete scaling.

The spiral motion along the hypersurface, together with a minimum geodesic separation $d_{\min} \sim 10^{10}$ Ly, provides a causal buffer that enforces uniformity of the cosmic microwave background without invoking inflation.

Within this 5-dimensional embedding, a black hole can be interpreted not as a singularity in absolute space, but as a localized deformation or “hole” in the hypersurface. Matter-energy concentrations curve the surface, creating regions from which light cannot escape along the surface’s geodesics. The black hole is therefore a topological feature of the hypersurface, rather than a singular point in an otherwise flat three-dimensional space.

5 The Pressure-Gradient Mechanism: Return Valves

Inside a black hole, gravitational pressure P_{BH} exceeds bulk pressure P_B, forcing a reverse-flow state:

$$\Phi_{reverse} \propto (P_{BH} - P_B) \tag{6}$$

This drain remains undetected because light is the sequestered medium. As black holes grow, they remove information back into the 4D bulk, maintaining the 1.46 trillion light-year hypersphere’s equilibrium and resolving the Hawking information paradox.

6 The Bottomless Pit Theorem: 1% Sequestration Logic

A primary contradiction in ΛCDM is the inability to reconcile a 6% biennial volumetric loss with a 1% mass density of Supermassive Black Holes (SMBHs). The RIM resolves this by defining SMBHs not as storage containers, but as **Bottomless Pits**—direct 4D conduits.

- **Throughput vs. Storage:** The 1% spatial footprint of SMBHs acts as a high-pressure nozzle.

- **Respiration Rate:** The 6% loss represents the manifold’s “Exhale” back into the 4D Core.

- **The 7.57 Constant:** This value represents the manifold's radial elasticity limit. At the 71.6 mean, the 0.1333 injection from the suns and the 6% sequestration through the pits achieve hydrostatic stability.

7 The Substrate Hypothesis: Space as a Guest Structure

We propose that the space we inhabit is a secondary 3D structure displacing a pre-existing 4D manifold.

- **Reassigning fudge factors**: Dark Energy and Dark Matter are re-contextualized as surface tension and displacement signatures of the 4D substrate.
- **Ancient wanderers**: Galaxies mature at $z > 10$ are 4D residents that have drifted into our observable 6% slice.

8 Empirical Predictions and Observational Signatures

1. **Void-injection events**: Detection of GRBs in local voids lacking progenitors.
2. **High-energy kinetic cargo**: Energy spikes in the 700 keV to 4.3 MeV range.
3. **Sustained flux duration**: Hours-long events (e.g. GRB 250702B) injecting up to 1.2 solar-masses.
4. **Expansion jitter**: A 20% increase in GRBs in 2026 leading to $H_0 \geq 74$ by 2027.

Discussion: The Sequential Afterglow and Bulk Curvature

It is a central tenet of the *Nichols Radial Injection Model* (RIM) that our 3D manifold is not a closed system. Because our observable slice is restricted to a 0.004 scale and the cosmological horizon is vastly distant (46.5 Gly), the terminal boundaries of our manifold remain empirically unobserved.

The Illusion of Flatness on a Hyperspherical Bulk

The RIM posits that absolute Euclidean flatness is a physical impossibility within a high-torque rotational system. Just as no segment on the surface of a ball is truly flat, our 3D manifold exists as a localized projection on a 5D hyperspherical bulk.

Even if future empirical data confirms the 3D observable manifold to be 100% flat, this is interpreted as a consequence of the narrow 0.004 horizon. At this scale, the arc-length of the 5D radius is sufficiently small that local measurements approximate zero curvature. This is a local artifact of scale, not a global universal property.

The Sequence of Slices and the CMB Afterglow

It is proposed that our universe is one in a continuous sequence of manifold injections. The Cosmic Microwave Background (CMB) currently observed is not a "start of time" signature, but the thermalized afterglow from previous possible universes (slices) that preceded our current temporal position.

9 Mechanics of Local Sequestration: The IST-1 Hypothesis

Standard cosmological models attribute the "local turn" of the Milky Way toward M31 to invisible Dark Matter halos. The *Nichols Radial Injection Model* (RIM) re-contextualizes this as a structural requirement of the 4D substrate.

9.1 The Intermediary Sequestration Terminal (IST-1)

We posit the existence of a (SMBH) situated in the void between the Milky Way and Andromeda. This terminal acts as a primary return valve for local 3D manifold volume back into the 4D core.

- **Mechanical Suction:** The IST-1 generates a localized pressure gradient that redirects the trajectory of local group galaxies, explaining the "turn" toward Andromeda.
- **Invisible Signature:** Because the intergalactic void lacks significant 3D debris, the IST-1 operates as a "Clean Drain," sequestering the 4D manifold itself without a visible accretion disk.
- **Mass-Parity Contribution:** This hidden drain accounts for a localized portion of the **1.0 km/s/Mpc sequestration delta** identified in the 20-year aggregate audit.

9.2 Predicted Lensing Signature for Vera C. Rubin Observatory

The 2026 activation of the Vera C. Rubin Observatory (Vera C) provides the ultimate falsification test for the IST-1.

1. **Astrometric Distortion:** We predict a persistent gravitational shear in the direction of the local group's turn, detectable via **Weak Gravitational Lensing** of background galaxies.
2. **Progenitor-less Warping:** Observations will reveal a significant mass-gravity signature without an accompanying electromagnetic (EM) source.
3. **$\mathbf{H_0}$ Jitter Correlation:** As Vera C monitors H_0 fluctuations, localized warping at the IST-1 will correlate with the 6% biennial volumetric loss identified in the RIM 22-year session.

The Moving Horizon: As we move towards this energy residue, and the preceding slice moves away within the curved 5D bulk, we perceive the "illusion" of a background wall. This geometry explains why mature, high-redshift galaxies are a predicted expectation of the model: they were seeded by the pre-existing structure of the manifold long before our current slice reached its position.

10 Final Conclusion: The 20-Year Equilibrium

The expansion of the data set from 3 to 7 epochs confirms the invariance of the Nichols Pulse Formula. By dividing the 20-year session into its constituent cycles, we derive a mechanical mean of 71.6 km/s/Mpc. This average, controlled by the 7.57 Manifold Constant, identifies the universe as a regulated 4D Hypersphere.

The "Hubble Tension" is effectively resolved as a sampling error. By treating the universe as a static Big Bang bubble, researchers fail to account for the 22-year respiratory cycle of the 4D Core. The 6% biennial loss through the 1% bottomless pits proves that we inhabit a dynamic, open-system manifold in a continuous state of mass-parity renewal.

Derived via the 0.1333 Scaling Factor.

End Dated Revision

Dated Revision: February 7, 2026

11 Hyperspherical Geometry and Emergent Curvature

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Applying the scaling factor iteratively to connect the largest-scale structure to fundamental injection points produces

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12 Expansion Rate Mapping: The 0.78647 Scaling Table

The following table provides the pre-calculated expansion metrics for the Radial Injection Model (RIM). By utilizing the constant 0.78647, we map raw GRB injection counts to the resulting manifold expansion response. This table provides the analytical headroom required for statistical outliers up to 200 annual events.

GRB Count (x)	RIM Expansion (y)	GRB Count (x)	RIM Expansion (y)
10	7.8647	110	86.5117
20	15.7294	120	94.3764
30	23.5941	130	102.2411
40	31.4588	140	110.1058
50	39.3235	150	117.9705
60	47.1882	160	125.8352
70	55.0529	170	133.6999
80	62.9176	180	141.5646
90	70.7823	190	149.4293
100	78.6470	200	157.2940

Table 2: Linear Expansion Metrics for Manifold Load Management.

Technical Note on Linear Scaling

The relationship $y = x \times 0.78647$ represents the structural efficiency of the 5D-to-3D transfer. It demonstrates that the manifold does not suffer from non-linear "runaway" expansion; rather, it scales in direct proportion to the injection frequency, governed by the 735 Gly curvature radius and the 10^{10} Ly causal buffer.

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