Project Ouroboros: Cosmological History Selection by Local Agency

Phase II Research Protocol & Auditing Pipeline

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Abstract

Phase I of the "Universal Ledger" investigation successfully developed a rigorous null-test pipeline, ruling out overt instrument-coupling artifacts ($> 10\sigma$) in Planck and COSMOS2020 data as manifestations of Zodiacal light and window-function aliasing. Phase II pivots to the **Biological Selection Hypothesis**. We propose that the "Axis of Evil" (CMB Quadrupole/Octupole alignment) is not a measurement error, but a *Selection Artifact*. We posit that the emergence of local biological agency requires specific initial conditions, effectively "selecting" a cosmological history from the quantum superposition at the Surface of Last Scattering ($z \sim 1100$) that is geometrically compatible with the local Solar System frame. This protocol outlines the methodology to search for subtle (3σ–4σ) signatures of this retro-causal selection in Parity Asymmetry, the Cold Spot, and High-Z Quasars.

1 Theoretical Framework: The Agency Selector

Standard ΛCDM assumes an objective past independent of the observer. The **Parochial by Construction (PbC)** framework argues that the "Past" is a reconstructed probability distribution.

- **The Hypothesis:** The specific micro-state of the CMB ($z = 1100$) is constrained by the existence of the observer's macro-state (Earth/Solar System) at $z = 0$.
- **The Mechanism:** A "Soft-Lock" where the observer's reference frame (Ecliptic/Solar Angular Momentum) imprints a preferred axis onto the primordial perturbations.
- **The Signature:** Structural alignments in the CMB and high-z matter distribution that cannot be explained by kinematics (dipole) or local foregrounds (Zodiacal dust).

2 Methodology: The Null-Test Engine

All investigations in Phase II must pass the three-stage forensic filter developed in Phase I to avoid false positives.

1. **Kinematic Isolation:** Explicit removal of the Monopole ($l = 0$) and Dipole ($l = 1$) modes. We search only for structural coupling ($l \geq 2$).
2. **Foreground Veto:** Parallel auditing of Raw maps (143/217 GHz) vs. Component-Separated maps (SMICA/SEVEM). A signal must persist in SMICA to be considered cosmological.

3. **Geometric Nulling:** Significance is determined via Monte Carlo simulations ($N \geq 100$) involving:
    - *Spatial Rotations:* Rotating the sky relative to the Solar System frame.
    - *Shuffled Controls:* Randomizing catalogs while preserving mask density (for Large Scale Structure).

3 Investigation Plan A: The Parity Mirror

Testing the alignment of Cosmic Parity Violation with Solar Helicity.

3.1 Rationale

The CMB displays an anomalous parity asymmetry (odd-parity modes slightly overpower even-parity modes). If the Solar System's formation selected this history, the axis of maximum asymmetry should align with the **Solar Angular Momentum Vector** (the Sun's spin axis), rather than the Ecliptic plane.

3.2 Execution Strategy

1. **Data:** Planck NPIPE and SMICA maps.
2. **Metric:** Calculate the Point-Parity statistic $P(n)$ for multipoles $l = 2$ to $l = 100$.
3. **Directional Scan:** Compute $P(n)$ along 3,072 directions (HEALPix grid).
4. **Test:** Does the dipole of the Parity Asymmetry point to the Solar North Pole (RA $\approx 286^\circ, \text{Dec} \approx 64^\circ$)?
5. **Validation:** Must survive Monte Carlo rotation of the map relative to the Solar axis.

4 Investigation Plan B: The Cold Spot Shadow

Testing the geometric nodal placement of the Eridanus Supervoid.

4.1 Rationale

The "Cold Spot" is a non-Gaussian anomaly (4σ) inconsistent with standard inflation. In the PbC context, this may represent a "probabilistic void"—a region of phase space emptied to maximize the probability of the local observer's existence.

4.2 Execution Strategy

1. **Data:** SMICA temperature map (strictly masked).
2. **Geometric Audit:** Calculate the coordinates of the Cold Spot center.
3. **Nodal Check:** Determine the distance of the Cold Spot from:
    - The Ecliptic Poles.
    - The intersection of the Galactic and Ecliptic planes (the Equinox nodes).

4. **Hypothesis:** If the Cold Spot is a selection artifact, it should lie at a harmonic node (e.g., 90° or 45°) relative to the Solar geometry.

5 Investigation Plan C: High-Z Quasar Soft-Lock

Searching for the fading tail of selection in the First Light era.

5.1 Rationale

Phase I showed galaxies at $z \sim 4$ are decohered. However, Quasars ($z > 6$) represent the era of Reionization, closer to the temporal boundary of the selection mechanism. They may exhibit a "Soft-Lock" alignment with the CMB Quadrupole.

5.2 Execution Strategy

1. **Data:** SDSS-IV / eBOSS / DESI High-Redshift Quasar catalogs ($z > 2.5$).
2. **Vector Alignment:** Instead of scalar density (which failed in P6), measure the **Polarization Vectors** (if available) or the **Separation Vectors** of quasar pairs.
3. **Correlation:** Correlate the quasar distribution vectors with the axis of the CMB Quadrupole ($l = 2$).
4. **Artifact Removal:** Apply the "Shuffled Randoms" protocol from Phase I to strictly rule out window-function aliasing (the "W" shape artifact).

6 Summary of Deliverables

- **Codebase:** Python scripts utilizing `healpy`, `astropy`, and `scipy.stats`.
- **Success Criteria:** A signal detection of $> 3.5\sigma$ that survives SMICA cleaning and Monte Carlo geometric nulling.