The Origin of the Matter-Antimatter Asymmetry as Structural Resonance Bias

David Plumb
david.plumb1980@gmail.com
github.com/dwpplumb/COMPASS

Abstract

We propose that the matter-antimatter asymmetry did not arise from particle interactions alone, but as a consequence of a structural asymmetry in the earliest phase of the universe. Specifically, we link the formation of a goal-directed gradient $\nabla Z(x)$ and the localized stabilization of feedback $\eta(x)$ to the emergence of a preferred structural channel — interpreted as the onset of observable matter.

1 Background: Classical Problem

The standard model predicts matter and antimatter creation in equal parts. However, only matter persists. Known CP-violation effects are insufficient to explain this imbalance quantitatively.

2 Structural Hypothesis

Before inflation:

$$\mathcal{M}(x) = (\rho \to \infty, \nabla Z = 0, \eta \to \infty)$$

All potential structures coexist in a superposed pre-state.

During collapse: - One structural channel becomes dominant due to instability - $\nabla Z(x) \neq 0$ emerges as the first semantic direction - $\eta(x)$ drops locally: a specific feedback path stabilizes - $\rho(x)$ projects a subset of possible configurations

3 Interpretation of Matter Dominance

Assume antimatter and matter differ in their response to $\nabla Z(x)$:

$$\eta_{\mathrm{M}}(x) < \eta_{\bar{M}}(x)$$

Then: - The structure of matter is more stable under projected directionality - Antimatter configurations decohere faster - Projection prefers matter through semantic feedback stability

4 Inflation as Enabling Mechanism

Inflation rapidly expands the structure space, reducing $\eta(x)$ system-wide. This prevents global backreaction, allowing a single structure path to persist. It provides the separation necessary for directionality and structural identity.

5 Conclusion

The asymmetry is not accidental, but follows from a universal principle: *Only structures that resonate with projected directionality can stabilize.* This structural resonance bias selects matter as the stable semantic configuration of our universe.