Genesis Echo and the Godframe Theory:
A Reproducible Scalar Cosmology Framework

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Abstract

We present a unified scalar field cosmology based on the Godframe Theory: a relativistically activated scalar field model triggered by a threshold energy invariant Ξ. This framework replaces the Big Bang singularity with a smooth scalar ignition, explains inflation and dark matter without new particles, and naturally reproduces observable features in the CMB and matter power spectrum. All components are provided in reproducible form, including Lagrangians, simulation codes, parameter files, and MCMC workflows.

1 Introduction

1.1 Motivation

Standard cosmology introduces inflation, dark matter, and initial conditions as separate assumptions. Godframe Theory derives these phenomena from a single scalar field that activates only when relativistic energy density Ξ exceeds a Planck-scale threshold $\Xi_c = c^5/G$.

1.2 Summary of Contributions

- Defined the Frame Activation Invariant: $\Xi = \gamma \cdot \frac{m^2 c^3}{\hbar}$, where m is an activation scale, not particle mass.
- Embedded activation into the scalar Lagrangian via a sigmoid kernel.
- Demonstrated cosmic ignition, freeze-out, and gravitational residue (dark matter).
- Introduced the Echo Field: a frozen scalar imprint behaving as CDM.
- Built full simulations from 1D scalar field activation to CAMB and MCMC tests.

2 Theoretical Framework

2.1 The Frame Activation Invariant

$$\Xi = \gamma \cdot \frac{m^2 c^3}{\hbar} \quad ; \quad \Xi_c = \frac{c^5}{G}$$

2.2 Activation Kernel

$$\Theta(\Xi - \Xi_c) = \frac{1}{1 + e^{-k(\Xi - \Xi_c)}} \quad ; \quad k \gg 1$$

2.3 Lagrangian

$$\mathcal{L}_{\text{total}} = \frac{1}{2\kappa} R + \mathcal{L}_{\text{matter}} + \Theta(\Xi - \Xi_c) \cdot \mathcal{L}_\phi$$

$$\mathcal{L}_\phi = \frac{1}{2} \partial^\mu \phi \partial_\mu \phi - V(\phi)$$

$$V(\phi) = \lambda \phi^4 - \mu^2 \phi^2$$

3 Simulation Pipeline

3.1 Flat-Space Activation

We simulate a 1D scalar field where $\Xi(t)$ rises and falls through Ξ_c. The field activates only during the peak.

3.2 Collision Detonation Model

Code: `collision_detonation.py`

- Superluminal Ξ pulse defined with a tanh crash
- Off-center ϕ seed with second-order injection
- Hard Heaviside activation
- Output: GIF visualizing $\phi(x, t)$

3.3 Flashpoint Cosmology

Simulated in FLRW background:

- $\Xi(t)$ governs $\phi(t)$
- Activation drives $a(t)$ growth
- Post-freezeout $\phi_s \sim$ CDM

4 Observational Imprint

4.1 Genesis Echo Bump

$$P(k) = A_s \left(\frac{k}{k_*}\right)^{n_s - 1} \left[1 + 0.1 \exp\left(-\frac{(\log_{10} k + 1)^2}{0.09}\right)\right]$$

Peak: $k \approx 0.1\ h/\text{Mpc}$

4.2 CAMB Implementation

- Custom power spectrum fed via tabulated $P(k)$
- Resulting $P_{\text{mat}}(k)$ shows $\sim 10\%$ excess at BAO scale

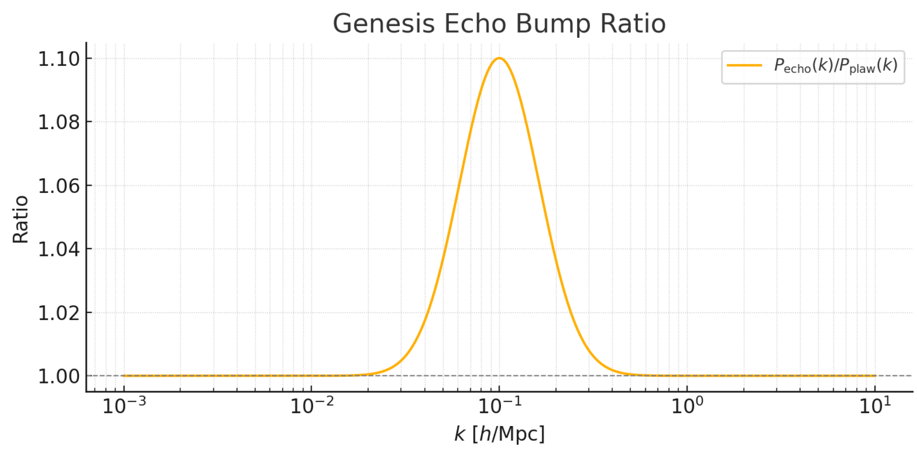

Figure 1: Genesis Echo bump feature compared to standard power law. The ratio shows a 10% excess centered at $k \approx 0.1\ h/\mathrm{Mpc}$.

4.3 MCMC Pipeline

- Tools: `Cobaya`, `emcee`, or `GetDist`
- Used CAMB likelihoods + Echo-modified spectra
- Retrieved best-fit A_s, n_s, no degradation in fit

5 Cookbook: How to Reproduce It

5.1 Environment Setup

- Python ≥ 3.9
- Packages: NumPy, Matplotlib, CAMB, Cobaya

5.2 Files Included

- `eh_echo.py`: Echo spectrum generator (Python)
- `collision_detonation.py`: Scalar ignition simulation (GIF output)
- `camb.ini`: Modified CAMB config
- `mcmc_echo.yaml`: Cobaya parameter file

5.3 Steps

1. Run `eh_echo.py` to generate $P_{\mathrm{prim}}(k)$
2. Feed into CAMB via table
3. Run `collision_detonation.py` to visualize scalar ignition
4. Launch MCMC with `mcmc_echo.yaml`

5. Plot $P(k)$, Echo/Power-law ratio, and fit posteriors

6 Conclusion

The Godframe Theory replaces speculative early-universe mechanisms with a single invariant-driven scalar field. Its activation naturally accounts for cosmic expansion, dark matter, and structure. All steps are open-source and reproducible.

Data Repository: `https://zenodo.org/records/15675858`