Monocosm-Bang Cycle: Black Hole Evaporation as the Engine of Cosmic Succession

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Abstract

We present a cyclic cosmological model where each universe evolves toward a single dominant black hole whose quantum evaporation triggers a subsequent Big Bang. The framework incorporates multiverse interactions through gravitational entanglement and resolves key thermodynamic paradoxes of eternal recurrence. Testable signatures include correlated CMB anomalies and distinct gravitational wave spectra.

1 The Monocosm-Bang Framework

1.1 Core Dynamics

Each universe evolves toward a solitary black hole via:

$$\frac{dN}{dt} = -\Gamma_{\text{merge}} N^{11/9} \tag{1}$$

$$\Gamma_{\text{merge}} = \frac{c^5}{G^{3/2}} \frac{\rho_{\text{BH}}^{2/9}}{M_{\text{avg}}^{1/3}} \tag{2}$$

Evaporation timescale for the final black hole:

$$\tau_{\text{evap}} = \frac{5120\pi G^2 M_{\text{final}}^3}{\hbar c^4} \sim 10^{100} \text{ years } (M_{\text{final}} \sim 10^6 M_\odot) \tag{3}$$

1.2 Quantum Explosion Mechanism

At critical mass $M_c = \sqrt{\hbar c/G}$:

$$\hat{H}|\psi\rangle = \left[\underbrace{\frac{\hat{p}^2}{2m_p}}_{\text{kinetic}} + \underbrace{V(\hat{g}_{\mu\nu})}_{\text{quantum gravity}} \right] |\psi\rangle = E_{\text{bang}}|\psi\rangle \tag{4}$$

Wavefunction collapse generates FLRW metric initial conditions.

2 Multiverse Interactions

2.1 Gravitational Entanglement

Adjacent universes interact through boundary terms:

$$S_{\text{multiverse}} = \int d^4x \sqrt{-g} \left(\frac{R}{16\pi G} + \mathcal{L}_m \right) + \oint_{\partial\mathcal{M}} \frac{K}{8\pi G} d\Sigma + \lambda \oint \mathcal{K}_{ij}\mathcal{K}^{ij} d\Sigma \tag{5}$$

Entanglement entropy:

$$S_{\text{ent}} = \min_{\partial A} \left[\frac{\text{Area}(\partial A)}{4G_N} + S_{\text{bulk}}(A) \right] \tag{6}$$

2.2 Multiverse Thermodynamics

Generalized second law:

$$d(S_{\rm BH} + S_{\rm rad} + S_{\rm ent}) \geq 0 \tag{7}$$

Mass transfer rate between universe i and j:

$$\frac{dM_i}{dt} = \sigma \frac{T_j^4 H_i^2}{(1 - e^{-\tau_{{\rm evap},j}/\tau_{{\rm H},i}}) \, (8)}$$

3 Observational Signatures

3.1 Gravitational Wave Background

$$\Omega_{\rm GW}(f) = \underbrace{10^{-9} f^{-7/3} e^{-(f/10^{-9})^4}_{\rm Monocosm} + \underbrace{B f^{-1/2} e^{-(f/10^{-15})^2}_{\rm Multiverse}}} \tag{9}$$

3.2 CMB Correlations

Angular power spectrum modification:

$$C_\ell = C_\ell^{\Lambda{\rm CDM}} \left[1 + D \exp\left(-\frac{(\ell - \ell_c)^2}{2\Delta\ell^2} \right) \right] \tag{10}$$

- $\ell_c = 16 \pm 2$ (angular scale of final BH)
- $D \sim 10^{-5}$ (Planck detectable)

4 Experimental Tests

Observatory	**Signature**	**Timeline**
LISA	$\Omega_{\rm GW}$ knee at 10^{-3} Hz	2034
NANOGrav	$f^{-1/2}$ GWB component	2026
CMB-S4	$\ell = 16$ CMB anomaly	2027
Euclid	Void distribution $P(R > 100{\rm Mpc})$	2030

Table 1: Testability roadmap

5 Conclusions

1. Solves entropy problem: Each cycle resets via quantum explosion
2. Multiverse interactions stabilize fundamental constants
3. Testable within 5-10 years via GW/CMB experiments

$$\boxed{\tau_{\rm cycle} = \tau_{\rm evap} \left[1 + \alpha \sum_j \left(\frac{M_j}{M_i} \right)^{3/2} e^{-d_{ij}/L_p} \right]}$$

where α quantifies multiverse entanglement strength.

```python
# Python code for GW spectrum
import numpy as np

def omega_gw(f, A=1e-9, B=1e-15):
    """Multiverse-modified GW spectrum"""
    monocosm = A * f**(-7/3) * np.exp(-(f/1e-9)**4)
    multiverse = B * f**(-0.5) * np.exp(-(f/1e-15)**2)
    return monocosm + multiverse
```