Anas Cosmogenesis Hypothesis v1.3:
Full Integration of Black Hole Burst, Nuclear Trigger, Anas Limit, PGI, and String Theory Connections

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Abstract

This version integrates all prior conceptual work, including black hole genesis, nuclear fusion beyond iron, parental gravitational imprint (PGI), and the Anas Limit derivation, while connecting these with string theory. It consolidates all previous papers and derivations into a single, deeply detailed document, preserving every line and concept from prior versions. This update (v1.3) includes the full numerical derivation of the Anas Limit and its astrophysical interpretation.

Contents

1 Introduction

The origin of the universe is one of physics' deepest questions. Previous work in black hole cosmology, bounce models, and inflationary theory leaves open questions about the initial singularity, gravity's universality, and quantum field integration. This hypothesis integrates nuclear physics, hypermassive collapse, and gravitational imprints to provide a deterministic mechanism for universe formation.

2 Definitions and Notation

- M_{parent}: Parent black hole mass.
- r_s: Schwarzschild radius.
- M_{core}: Collapsing stellar core mass.
- M_{OV}: Oppenheimer–Volkoff limit.
- $E_{\text{nuc}}(Z)$: Nuclear energy per fusion event.
- $\Phi^{(p)}_{\mu\nu}$: Parental gravitational imprint (PGI).
- S_{BH}: Black hole entropy.
- $a(t), \rho(t), p(t)$: Child universe scale factor, energy density, pressure.
- M_{Anas}: Anas Limit mass.
- ρ_{crit}: Critical density for hypermassive collapse.

3 High-Level Mechanism — Stepwise

Step 1: Hyper-massive progenitor formation exceeding M_{Anas}.

Step 2: Nuclear fusion beyond iron in core becomes endothermic, amplifying gravitational dominance.

Step 3: Runaway collapse, degeneracy pressure fails, exotic EoS triggers non-singular transition.

Step 4: Black hole burst / parent "bust": spacetime reconfiguration, PGI emission.

Step 5: Inheritance of PGI, matter/entropy seeding child universe.

Step 6: Child universe expansion, thermalization, and early nucleosynthesis.

4 Anas Limit — Derivation and Numerical Evaluation

Equate core radius to Schwarzschild radius:

$$R_{core} = \left(\frac{3M_{\rm Anas}}{4\pi\rho_{\rm crit}}\right)^{1/3} = \frac{2GM_{\rm Anas}}{c^2}, \tag{1}$$

which yields:

$$M_{\rm Anas} = \sqrt{\frac{3}{32\pi}}\frac{c^3}{G^{3/2}\sqrt{\rho_{\rm crit}}} \approx 0.1727470747\frac{c^3}{G^{3/2}\sqrt{\rho_{\rm crit}}}. \tag{2}$$

For a critical mean density of $\rho_{\rm crit} = 2.8 \times 10^{17}\,\mathrm{kg/m^3}$ (nuclear density scale):

$$\sqrt{\rho_{\rm crit}} = 5.2915 \times 10^8, \tag{3}$$

$$G^{3/2} = 5.453 \times 10^{-16}, \tag{4}$$

$$c^3 = 2.6979 \times 10^{25}. \tag{5}$$

Combining these terms:

$$M_{\rm Anas} = 0.1727470747 \times \frac{2.6979 \times 10^{25}}{(5.453 \times 10^{-16})(5.2915 \times 10^8)} \tag{6}$$

$$= 1.616 \times 10^{31}\,\mathrm{kg} \approx 8.13\,M_\odot. \tag{7}$$

4.1 Interpretation

At a critical density corresponding to nuclear matter ($\rho_{\rm crit} \approx 2.8 \times 10^{17}\,\mathrm{kg/m^3}$), the Anas Limit occurs at approximately eight times the Sun's mass. Beyond this threshold, no known equation of state can stabilize the core, and the collapse enters the regime of black hole burst cosmogenesis. This threshold marks the transition from black hole formation to child-universe formation.

5 Mathematical Placeholders

5.1 PGI Ansatz

$$g^{(c)}_{\mu\nu} = \bar{g}_{\mu\nu} + \epsilon\Phi^{(p)}_{\mu\nu}, \tag{8}$$

with constraints $\nabla^{\bar{g}}_\mu \Phi^{(p)\mu}{}_\nu = 0$ and optional trace-free ansatz.

5.2 Effective Field Equations

$$G_{\mu\nu}[g^{(c)}] + \Lambda g^{(c)}_{\mu\nu} = 8\pi G\left(T^{\rm matter}_{\mu\nu} + T^{\rm PGI}_{\mu\nu}\right), \tag{9}$$

$$T^{\rm PGI}_{\mu\nu} = \frac{1}{8\pi G}\left(\mathcal{L}_\Phi g_{\mu\nu} - \frac{\delta\mathcal{L}_\Phi}{\delta g^{\mu\nu}}\right). \tag{10}$$

5.3 Entropy Mapping

$$S_{child}(t_0) = \mathcal{M}(S_{BH}, \{\alpha_i\}), \quad S_{child} \leq S_{BH}. \tag{11}$$

5.4 Toy Spherical Metric

$$ds^2 = -f(r,t)dt^2 + g^{-1}(r,t)dr^2 + r^2 d\Omega^2, \quad f(r,t) = 1 - \frac{2G\mathcal{M}(r,t)}{r} + Q(r,t). \tag{12}$$

6 Connection to String Theory

Burst excites string modes, providing boundary conditions:

$$\Psi_{string} \sim f(E_{burst}, r_s, \Phi^{(p)}_{\mu\nu}). \tag{13}$$

The vibrational origin of string theory may thus correspond to the spacetime turbulence generated during black hole evaporation and universe birth events. Each child universe may represent a distinct vibrational mode in the higher-dimensional space-time fabric.

7 Observational Signatures

- PGWB anomalies, non-scale-invariant features.
- Heavy-element anomalies in ancient stars.
- CMB large-angle anisotropies and non-Gaussianity.
- Indirect signatures of string-mode excitations.

8 Roadmap and Next Steps

1. Numerical relativity simulations including hypermassive collapse.
2. Tensorial PGI evolution and child universe imprint.
3. String-theory modeling of burst excitations.
4. Analytical studies linking Anas Limit to TOV and Chandrasekhar limits.
5. Prediction of observable consequences in GW, CMB, and primordial nucleosynthesis.

9 Conclusion

This document fully integrates all previous drafts, Anas Limit derivations, PGI concepts, nuclear triggers, and string-theory connections into a deep, comprehensive, and mathematically structured framework for universe formation via black hole bursts. The newly quantified Anas Limit ($M_{\text{Anas}} \approx 8.13 M_{\odot}$) serves as the critical threshold separating gravitational collapse from cosmogenic rebirth.