

# The Drain-Bridge Cosmological Model: A Generative Alternative to the Big Bang

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## Abstract

We propose the Drain-Bridge Cosmological Model as an alternative to the standard Big Bang framework. This model replaces the singular origin with a black hole-to-white hole transition, suggesting that each universe is born through the interior of a black hole within a parent universe. This framework resolves classical issues such as infinite compression, singularities, and the need for a temporal origin. It supports a causally connected multiverse of unique, generational universes, governed by a continuous meta-time. We discuss the theoretical motivation, structural implications, mathematical framework, and observational possibilities of this model.

## 1. Introduction

The prevailing Big Bang theory asserts that our universe began from an initial singularity approximately 13.8 billion years ago. While the model accounts for observable cosmic expansion, background radiation, and elemental abundances, it does not adequately resolve the initial conditions problem, the nature of singularities, or the fate of information within black holes. The Drain-Bridge Cosmological Model (DBCM) offers an alternative in which black holes are cosmogenic engines: finite storage vessels that eventually transition into white holes, birthing causally disconnected universes.

## 2. The Drain-Bridge Hypothesis

We hypothesize that a black hole's interior evolves through a transitional geometry ("drain") into an expanding region on the other side a white hole. The resulting white hole constitutes the Big Bang of a new universe. The bridge connecting the two represents a continuous, non-singular extension of spacetime. This aligns with quantum gravity insights that singularities may be resolved into smooth transitions. The hypothesis builds on ideas from loop quantum cosmology (Ashtekar et al., 2006), Planck stars (Rovelli & Vidotto, 2014), and cosmological natural selection (Smolin, 1992).

## 3. Finite Storage and Cosmic Release

Classical general relativity allows for infinite matter compression inside black holes. However, this leads to violations of information conservation and thermodynamic inconsistency. In DBCM,

black holes can store mass-energy only up to a critical limit. When this is reached, internal spacetime undergoes a geometric phase shift the bridge opens, and the contents are expelled into a new universe. This resolves both the singularity and information loss paradoxes.

#### 4. Mathematical Framework of the Drain-Bridge Model

##### 4.1. Black Hole Geometry and Bridge Connection

We begin with the Schwarzschild solution of Einsteins field equations:

$$ds^2 = -(1 - 2GM/r)c^2dt^2 + (1 - 2GM/r)^{-1} dr^2 + r^2 d^2$$

To remove coordinate singularities at the event horizon  $r = 2GM/c^2$ , we apply Kruskal-Szekeres coordinates:

$$ds^2 = (32G^3M^3/r) e^{-r/2GM}(-dT^2 + dX^2) + r^2 d^2$$

This structure reveals the possibility of a continuous bridge between the black hole and a white hole region.

##### 4.2. Proper Time Through the Bridge

The proper time experienced by an infalling observer is given by:

$$d^2 = -g_{\alpha\beta} dx^\alpha dx^\beta$$

This implies that finite proper time can elapse during the transition through the bridge, allowing causal continuity between universes.

##### 4.3. Mass-Energy Transition and Storage Limit

The Bekenstein-Hawking entropy defines the upper bound of information stored in a black hole:

$$S = (4kGM^2)/(c)$$

This sets a finite storage limit. Upon reaching this limit, the transition occurs through the bridge into a new expanding spacetime region.

##### 4.4. Recursive Universe Generation

The number of descendant universes generated through black holes can be expressed recursively:

$$N(t) = R(t)N(t) dt$$

Where  $R(t)$  is the black hole formation rate in each universe.

##### 4.5. Meta-Time and Eternal Chain

Each universe has its own internal proper time  $\tau_i$ , but the meta-cosmos time is cumulative:  
 $T_{\text{meta}} = \tau_i$  or  $T_{\text{meta}} = \int (u) du$

This supports a past-eternal framework without requiring a singular origin.

## 5. A Mega Multiverse: Diversity, Not Parallelism

Unlike quantum or inflation-based multiverse theories that produce parallel or nearly identical universes, DBCM results in diverse universes. Each black hole forms at a different time, under different conditions, and results in a universe with distinct physical constants, energy densities, and lifespans. The resulting mega multiverse is a cosmic tree of genealogically related but physically unlike universes.

## 6. Observational Implications

In classical models, black holes are optical barriers. In DBCM, spacetime around a black hole may allow light to bend or partially pass through, enabling potential visibility of background structures. This model predicts:- Anomalous gravitational lensing patterns,- Finite storage constraints in supermassive black holes,- Observational signals related to white hole activity (e.g., gamma ray bursts).

## 7. Figures

Figure 1: Drain-Bridge Geometry Conceptual diagram showing a black hole funneling spacetime into a transitional bridge, leading to an expanding white hole and a new universe.

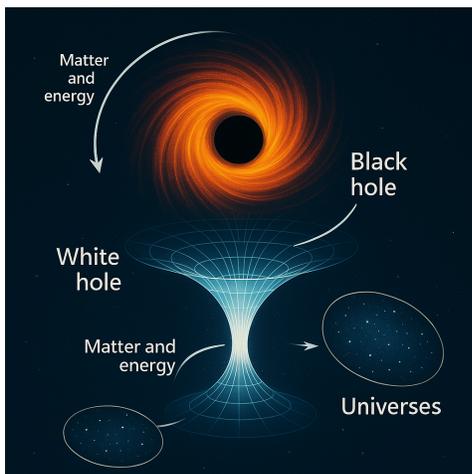


Figure 2: Recursive Cosmic Tree of Universes Figure 2 illustrates the recursive cosmic tree of universes, where each universe (circle) is born from a black hole in a parent universe, forming a branching structure over time. It symbolizes a generational multiverse, not parallel but causally connected, with each universe existing in its own spacetime domain. This does not imply they share a common physical space, but that they emerge from one another in a growing cosmic lineage

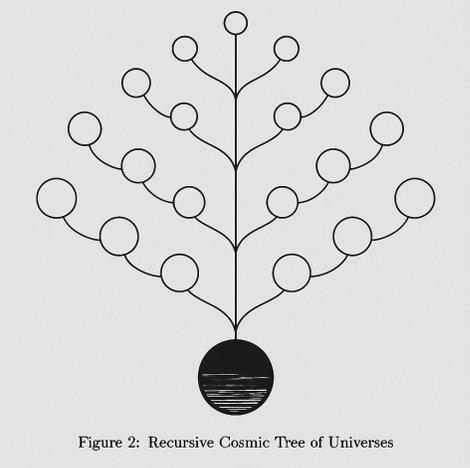
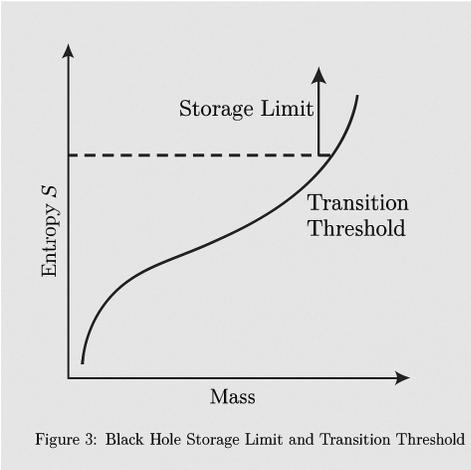


Figure 3: Black Hole Storage Limit and Transition Threshold Figure 3 depicts the relationship between a black hole's mass and its entropy, highlighting a critical storage limit. As a black hole accumulates mass, its entropy increases until it reaches a theoretical threshold the "Transition Threshold" beyond which it can no longer contain the information. This point triggers a geometric transformation, expelling the contents into a new universe via the bridge.



## 8. Conclusion

The Drain-Bridge Cosmological Model offers a novel generative cosmology in which black holes are seeds of new universes, rather than endpoints. This resolves singularity-related paradoxes, introduces a finite mass-storage limit, and supports a recursive, causal, and eternal meta-cosmos. Future work will develop numerical simulations, observational predictions, and potential connections to quantum gravity.

## References

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