[original insight]

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The exterior of the universe and the interior of a black hole

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Abstract

We propose that “outside the universe = inside a black hole”.

keywords: universe, big bang, black hole, topology, logic, boundary

Introduction

1. Two cosmic events might be inherently correlated, namely, Black Holes (BH) and the Big Bang (BB).
2. The **Big Bang** is the very *creation* of **space** and **time**.
3. **Black holes** are (probably) the very *end* of **space** and **time** [1–3].
4. Both BH and BB have a boundary.
5. The *boundary* of a *black hole* is its *event horizon*.
6. Assume the universe is spherical with a certain radius.
7. The *boundary* of the *big bang* is the *surface* at its radius.

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Axioms, Premises and Theorems

8. Let $A, B, C, \dots$ be mathematical formulas that prove a physical theory, theoretically or experimentally.
9. The formulas in (8) are either axioms or theorems within the physical theory.
10. In the following, we state the meaning of (8).

Axioms

11. B : the big bang event (axiom 1)
12. Z : radius of the universe (axiom 2)
13. $S(x)$: spacetime at $x \in \mathbb{R}$ (axiom 3)
14. $H(r)$: the event horizon of a black hole with radius r (axiom 4)

Premises and Definitions

15. $X \equiv (\exists x \neg S(x))$: there exists at least one mathematical object/structure with no spacetime dimensions (premise 5)
16. $Y \equiv (\exists x_1 ((x_1 > Z) \wedge \nexists S(x_1)))$: there is no spacetime outside the universe (premise 6)
17. $L \equiv (\forall x_2 < r (\nexists S(x_2)))$: there is no spacetime inside the black hole [1–3] (premise 7)
18. L stands for *hollow black hole* [1]
19. $N(x)$: nature of the mathematical object/structure with no spacetime dimensions (definition 8)

Theorem

20.

$\vdash B$	(axiom)
$\vdash Z$	(axiom)
$\vdash S(x)$	(axiom)
$\vdash H(r)$	(axiom)
$\vdash X$	(premise)
$\vdash Y$	(premise)
$\vdash L$	(premise)
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$\vdash \nexists x((x < r) \wedge (x > z))$	(conclusion)
$\vdash N(x_1) \equiv N(x_2)$	(conclusion)

21. Let $P \equiv (B \wedge Z \wedge S(x) \wedge H(r) \wedge X \wedge Y \wedge L)$.

22. Let $Q_1 \equiv (\nexists x((x < r) \wedge (x > z)))$.

23. Let $Q_2 \equiv (N(x_1) \equiv N(x_2))$.

24.

$$P \vdash Q_1 \wedge Q_2 \quad \square$$

Final Remarks

25. What is inside a black hole and outside the universe? Are there mathematical objects/structures?
26. If the Big Bang theory is correct, then there might exist some *mathematical structure* with neither spatial nor time dimensions.
27. The border of the universe, if it exists, is a boundary that at one side, spatial and time dimensions can coexist, while at the other “side”, there is no space and time dimensions at all.

28. In simple words, we conclude that, *what is “outside” the universe is the same as what is “inside” a black hole.*

Open Invitation

Review, add content, and **co-author** this paper [4, 5]. *Join the* **Open Physics Collaboration**. Send your contribution to mplobo@uft.edu.br.

Ethical conduct of research

This original work was pre-registered under the OSF Preprints [6], please cite it accordingly [7]. This will ensure that researches are conducted with integrity and intellectual honesty at all times and by all means.

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