**The Light-Speed Boundary Hypothesis**

Clinton Fisher, 2025  
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**Abstract**

This hypothesis proposes that the speed of light ($c$) is not merely a physical speed limit but the ontological boundary between existence and nonexistence. At or beyond $v = c$, no time, space, mass, entropy, or causality exists. The Big Bang, in this model, was not an explosion within space, but the first and only rupture of this light-speed boundary — the moment when structured being emerged from absolute null-state. This hypothesis offers a boundary-based mechanism for the emergence of spacetime and proposes that subsequent breaches (e.g., mass accelerated to $v = c$) may give rise to new universes. It reframes cosmogenesis as a singular act of structured energy intruding into lawless nothing.

**1. Introduction**

Standard cosmology describes the Big Bang as the rapid expansion of space from an initial singularity. Yet it does not explain *why* that singularity occurred. Nor does it account for what, if anything, preceded time, energy, or physical law. This hypothesis introduces a new foundational postulate: that the speed of light defines not only a boundary in relativity, but the very edge of being. Beyond it lies a domain not of vacuum, but of absolute nothingness — devoid of laws, dimensions, and mathematics. The Big Bang is reinterpreted as the crossing of this light-speed threshold by structured energy into a null zone, triggering the emergence of spacetime.

**2. Core Hypothesis**

Reality begins only when three conditions are violated:

* Velocity drops below $v = c$
* Time becomes non-zero ($\tau > 0$)
* Structure intrudes upon the lawless null

Formally:

Existence={False,v≥cTrue,v<c\text{Existence} = \begin{cases} \text{False}, & v \geq c \\ \text{True}, & v < c \end{cases}

The Big Bang is the moment this transition occurred:

τ=t⋅1−v2c2⇒0 as v→c\tau = t \cdot \sqrt{1 - \frac{v^2}{c^2}} \Rightarrow 0 \text{ as } v \rightarrow c

This boundary crossing is not an event in time — it is the **origin of time itself.**

**3. Supporting Scientific Foundations**

* **Special Relativity**: Time halts at $v = c$. Proper time $ au = 0$ implies a timeless boundary condition.
* **General Relativity**: Space and time emerge from the presence of mass-energy. No mass implies no spacetime curvature.
* **Thermodynamics**: Entropy cannot evolve where time is absent. Thus entropy is undefined at $v = c$.
* **Quantum Physics**: Quantum emergence may require a spacetime substrate — but this hypothesis argues that the substrate itself formed *from* the light-speed boundary.

**4. The Null-State and Boundary Structure**

Let $\mathcal{N}$ denote the null-state: a domain where $t = 0$, $m = 0$, $E = 0$, and laws do not apply.

The Big Bang is defined as the first structured energy to cross from $\mathcal{N}$ into $\mathcal{U}$:

If m≠0, v=c, E∈N,⇒N→Unew\text{If } m \neq 0,\ v = c,\ E \in \mathcal{N}, \Rightarrow \mathcal{N} \to \mathcal{U}\_{\text{new}}

This transition is a rupture, not a fluctuation. It defines the light-speed boundary $\partial \mathcal{N}$ as:

∂N={x∈R4∣v=c}\partial \mathcal{N} = \left\{ x \in \mathbb{R}^4 \mid v = c \right\}

**5. Recursive Universe Genesis**

Once this model is accepted, it implies the potential for multiple universes. If mass from within a universe were somehow accelerated to $v = c$, and thus crossed back into $\mathcal{N}$, it could create a new causal region.

The energy condition:

E=γmc2→∞ as v→cE = \gamma mc^2 \rightarrow \infty \text{ as } v \rightarrow c

If this infinite energy enters the lawless null, it may generate:

* A new spacetime metric
* New constants
* A causally disconnected universe

This is a **recursive genesis mechanism**, not unlike baby universes — but based on **ontological boundary rupture**, not internal evolution.

**6. Metaphysical Interpretation**

Where most models rely on quantum fluctuations or multiverse inflation, this hypothesis assumes nothing exists beyond $v = c$. There is no backdrop of quantum foam. No pre-existing laws. Thus:

* There is no law *against* faster-than-light speed
* There is no conservation of energy in $\mathcal{N}$
* **Anything introduced into it becomes the seed of structure**

This removes the need for initial conditions, fine-tuning, or eternal inflation.

**7. Implications**

* The Big Bang was a boundary event, not an explosion
* Time, space, and energy are the results of one boundary violation
* The speed of light is not a constant of physics alone — it is a **causal perimeter**
* New universes may emerge if that boundary is crossed again

**8. Proposed Tests and Extensions**

* **Entropy Horizon Modeling**: Explore $\lim\_{v \to c} dS/dt$
* **Mathematical Field Extension**: Map $\mathcal{N} \to \mathcal{U}$ using distribution theory
* **Null-to-Being Diagrams**: Visualize the causal bubble forming from nothing
* **Black Hole Analogy**: Investigate whether black hole interiors approximate $\mathcal{N}$

**9. Philosophical Considerations**

If nothing existed before the Big Bang, not even math, then the emergence of logic itself must be part of the rupture. This invites reconsideration of:

* Whether physical law is emergent, not eternal
* Whether reality is a rule system born from its own violation
* Whether crossing $v = c$ is not just a physical act, but a *creative* one

**10. Integration with the Observer Threshold and Jellfold Hypotheses**

The Light-Speed Boundary Hypothesis defines the **origin of spacetime** as a rupture through the $v = c$ boundary into a lawless null. Once this rupture forms a causal bubble, the universe evolves internally. This is where the **Observer Threshold Hypothesis** and **Jellfold Hypothesis** become relevant.

* The **Observer Threshold Hypothesis** proposes that classical moments — including time itself — only emerge at observation points where light, gravity, and measurement intersect. This mechanism operates **within** the spacetime bubble created by LSBH.
* The **Jellfold Hypothesis** describes the **entangled substrate** into which collapse ripples propagate. It defines the **structural topology** of the universe once spacetime exists.

Together, these three hypotheses form a layered cosmology:

* LSBH explains **how the universe began**
* Jellfold describes **what the universe is made of**
* Observer Threshold defines **when and where reality becomes classical**

Each model is valid on its own, but together they offer a more comprehensive view of emergence, structure, and collapse.

**11. Conclusion**

The Light-Speed Boundary Hypothesis reframes the origin of the universe as a one-time rupture through the edge of being. Instead of beginning in a singularity, we began at the moment structured energy crossed into a state of pure non-being. This redefines cosmology not as a story of inflation, but as the first crossing into time itself.

By integrating this model with the **Observer Threshold Hypothesis** and **Jellfold Hypothesis**, a unified framework emerges: the universe begins at the boundary (LSBH), takes form within an entangled fluid (Jellfold), and expresses reality through collapse thresholds (Observer Threshold). This layered model offers a new path toward reconciling quantum physics, relativity, and cosmology — one rooted in emergence rather than assumption.

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