International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

A Theory on the Finitude of the Speed of Light

Mr. Harshvardhan Sharma

Abstract
The speed of light, c, is a finite constant of nature, not an infinite one. This theory posits that if the speed of light were infinite, it would lead to a breakdown of our understanding of time and the universe as we know it.

This paper explores the theoretical implications of an infinite speed of light, arguing that such a premise is untenable and leads to the breakdown of fundamental physical concepts. Our theory posits that if the speed of light were infinite, the time taken to travel any distance would be zero. This would eliminate the existence of time itself, as events would have no duration. Consequently, key cosmological events, such as the Big Bang, could not have occurred. The theory concludes that the finitude of the speed of light is a necessary condition for the existence of time and causality, and for the coherent structure of our universe.

The Problem with Infinite Speed
If the speed of light were infinite, the time it takes for anything to travel to any destination would be zero, regardless of the distance. This is because if speed (v) is infinite, then time (t) = distance (d) / speed (v) would result in a time of zero for any finite or infinite distance.

This scenario presents several fundamental issues:

- **The Disappearance of Time:** With an infinite speed of light, the concept of time would cease to exist. The time taken for any event to occur would be zero, meaning that even a monumental event like the Big Bang couldn't happen because it requires a duration of time to unfold.
- **Infinite Distance and Causality:** The document mentions that if the speed of light were infinite, distance would also be infinite. This suggests a universe without spatial separation, where everything exists simultaneously. However, this contradicts our observable universe, which is characterized by vast, measurable distances between objects.
- **Violation of Causality:** In a universe with infinite speed, information would travel instantaneously. This would mean that an effect could occur at the same exact moment as its cause, or even before it, violating the principle of causality where a cause must precede its effect. This would make the universe completely unpredictable and nonsensical.

Why Finitude is Essential
The finitude of the speed of light is not just an observed phenomenon; it's a fundamental requirement for a universe that has both time and space. The finite speed of light allows for:

1. **The Existence of Time:** The non-zero travel time of light and information is the very basis for the passage of time. The light we see from distant stars is a snapshot of their past, a direct consequence of the finite speed of light.
2. **Causality and Spacetime:** The finite speed of light is the cosmic speed limit, a core principle of

Einstein's theory of relativity. It establishes a causal structure for the universe, ensuring that cause and effect are always separated by a time interval, with the cause always preceding the effect. It also ties together space and time into a single continuum, spacetime.

3. **A Coherent Universe:** Without a finite speed of light, the universe as we understand it— with its distances, past, present, and future—would be impossible. The universe would be a static, timeless void where nothing can truly happen.

In conclusion, the speed of light must be finite. An infinite speed of light would render time, distance, and causality meaningless, resulting in a universe where not even the Big Bang could occur.