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RANDOM AND ARBITRARY CONTINGENCIES IN HISTORY OF SCIENCE AND TECHNOLOGY [2] – THE INITIAL SINGULARITY OF BIG BANG COSMOLOGY

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ABSTRACT

In the Big Bang cosmology, the initial singularity does not have any causal connection to the Big Bang itself, a random occurrence of pure chance. There is no physical link from the initial singularity to the Big Bang. This random occurrence of pure chance is a fundamental aspect of the theory.

KEYWORDS: big bang, initial singularity, Hoyle, pure chance, random occurrence, arbitrary incidence, missing causal link

INTRODUCTION

The initial singularity in the Big Bang cosmology is defined to be a mathematical point with an infinite (energy) density. Here, the (energy) density is the total mass (and energy) of the singularity divided by its volume in which its total mass (and energy) should be equal to the total mass (and energy) of the universe throughout the entire history of the universe, guaranteed by the conservation of mass (and energy) in a closed system of the universe itself. On the other hand, the volume of the singularity is zero by the definition of a mathematical point. At the same time, density is equal to pressure and then to temperature in turn. Thus, the initial singularity, supposedly the beginning of the universe, has an infinite (energy) density, pressure, and temperature with no space (and time) inside.

The Big Bang, a Random Occurrence of Pure Chace

Can any physical meaning of the singularity be assigned? In a physical world, anything involved with an infinity cannot possibly be a physical reality of an entity. In this respect, the initial singularity has raised a fundamental question whether it truly is a physical beginning of the entire universe.

Can it still trigger the beginning of the universe? Not really. The reasons are as follow. First, not being

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part of our universe, the space and time outside the initial singularity is totally irrelevant to us, even if there is any space and time outside. Whatever the processes, if any, outside of our universe has nothing to do with us. Second, defined to have zero space, the initial singularity as a mathematical point has no space (and time) inside. With zero space inside and outside, no physical process can possible trigger the Big Bang, the beginning of the universe, from the initial singularity. Thus, the initial singularity does not have any causal connection to trigger the Big Bang which is just an unexpected random occurrence of pure chance. The beginning of the universe is a random and arbitrary contingency of pure chance. Nonetheless, astronomers and physicists are trying to provoke some exotic physics to trigger the Big Bang from the initial singularity. Yet, all of these unsuccessful efforts go nowhere so far. In their minds, there should be nothing random and arbitrary at the beginning of the universe.

On the other hand, since there is no causal connection, some arguments can also be made for the impossibility for the Big Bang itself. It was, in fact, Fred Hoyle who mockingly criticized the physically impossible status of the initial singularity with its lack of a causal link to the Big Bang process (for example, Hoyle 1948). Instead, Hoyle proposed the steady state cosmology in which the universe is infinitely old and vast with no beginning and boundary. However, with the discovery of the cosmic microwave background radiation which seems to indicate that the universe had an era of higher temperature, the Big Bang cosmology was favored by a majority of physicists and astronomers 1960s.

In the Big Bang cosmology, the initial singularity's lack of a causal link to the Big Bang process can only be resolved by introducing a random occurrence of pure chance for the Big Bang. Apparently filling the missing causal link between the initial singularity and the Big Bang, this concept of random and arbitrary contingency of pure chance is, however, not manifested in a standard text book. As stated above already, there should be nothing random and arbitrary at the beginning of the universe in the text book.

Perhaps, scientists are not yet ready to accept this random and arbitrary occurrence as a part of their theory. Regardless of their reluctance, it is obvious that a missing physical link between the initial singularity and the Big Bang process at the most fundamental level of the Big Bang cosmology requires some purely random and arbitrary event.

CONCLUSION

The initial singularity in the Big Bang theory lacks a causal connection to the Big Bang process. However, this missing physical link in the theory at its most fundamental level is not yet fully manifested either in their story telling or in a science text book. This missing link introduces a concept of a random and arbitrary incidence of pure chance for the Big Bang process from the initial singularity.

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