Singularity of the Universe

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Abstract: Cosmologists have developed many theories to explore the ultimate origin of the universe. There are three main branches including scientific cosmology, philosophical cosmology, and theology. Although all the existed theories get to the point very closely, every theory has its own shortage. Scientific cosmologies fail to explain singularity due to all the known laws of physics break down in it. Philosophical cosmologies stuck in the cause of the universe could not be the universe itself. Theologies meet with the same dilemma. God being the whole universe or a part of it if He/She exists in it cannot be the cause of it. Taking into account the advantages and weaknesses of all the existed theories, I neglect all the known laws of physics and make use of pure mathematical functions. The calculation result reveals there is a singularity. Interestingly, the singularity is *negative universe* that could be the answer to the first cause of the universe.

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I. Introduction

Human beings have been trying to explore the beginning of our universe from time to time continuously. Cosmologists had developed a plenty of theories rapidly last century. From different points of view, cosmologies can be divided into three main branches such as scientific cosmology, philosophical cosmology, and theology.

As early as 1917, Alexander Friedman realized that expanding universe must have begun with a singularity[1]. In 1915, Albert Einstein developed his theory of general relativity[2]. He was interested in gravity[3-8]. The gravity will make the universe collapse into a singularity[9-12]. However, all the known laws of physics break down in singularity. To get around this difficulty, Einstein invented the "cosmological constant" -- a hypothetical repulsive force operating on large scales that prevented the collapse of the universe. According to this assumption, he could not find the first cause of the ultimate origin of the universe.

In 1983, James Hartle and Stephen Hawking developed quantum cosmology[13]. They proposed that a cosmic wave function could be applied to the entire universe similar to the wave function that quantum mechanics had applied to elementary particles. According to this approach, the usual distinction between future and past breaks down in the very early universe. In order to improve the theory of relativity, Stephen Hawking developed the black hole theory[14-27]. Nevertheless, after applied different laws to black holes, he could not get any breakthrough for the barrier of singularity. In 1988, he guessed that black holes are not so black in his book A Brief History of Time[28]. Penrose-Hawking theorems address that anybody undergoing gravitational collapse must eventually form a singularity. The singularity problem is still the barrier for the investigation of ultimate origin of the universe.

Edwin Hubble discovered the redshift of galaxy light in the 1920s. The redshift of the light from galaxies is proportional to their distance (as inferred from brightness). No cause of galaxy redshift other than a velocity away from the observer was considered plausible, so Hubble's result was taken to mean that, the farther away from us a galaxy is, the faster it moves away from us. Hence, the overall universe had to be expanding. And the ultimate origin of the universe should be a singularity for the time regress. This evidence supports the big bang theory. The big bang theory postulates that the entire universe originated in a cosmic explosion about 15-20 billion years ago. It is true that physicists hope to look behind the big bang, and possibly to explain the origin of our universe as, for example, the first cause of the universe. Unfortunately, the creation of universe could not be tested by experiments.

Edward Tryon first suggested that the universe might be a vacuum fluctuation[29], "essentially from nothing at all". Alexander Vilenkin also addressed that it would be better to start with "literally nothing", which was not matter, space or time, but a total empty geometry of absolute nothingness from which the universe made the transition to a non-empty state by quantum tunneling[30]. Another originator of the idea of an inflationary early universe Alan Guth pointed out that the beginning of the universe there was nothing, a pure vacuum with no space or matter, a vacuum which is subject to quantum uncertainties so that things can come out of it and vanish back into it[31]. All of them are getting closer and closer to find the answer for the ultimate origin of the universe except singularity.

The cosmologist, P. James E. Peebles, said that there is strong evidence that most of the mass of the universe cannot be accounted for by the things we see, but there must be some sort of unknown dark matter[32]. Nevertheless, the dark matter as a part of the universe if it exists could not be the cause of the universe.

More recently, Vilenkin and Jaume Garriga developed a "many worlds in one" theory in which our universe contains an infinite number of other universes, or O-regions, where alternate histories play themselves out[33]. In 1957, Hugh Everett[34-35] explained the possible states do not collapse, but the universe somehow divides, and accommodates each possibility in a new world. Bryce DeWitt[36] and David Deutsch[37] even claimed that each time we do something, or each time something, no matter how small, changes in the universe, a new universe is created, and therefore millions and billions of universes are being created at every moment. Considering the differences, one will wonder how to distinguish the edges of those different worlds. The question is back to singularity.

The philosophical cosmologists try to fathom two facts. Firstly, the universe exists. And secondly, it exists in a distinctive way. The philosophical challenge is whether something can come from nothing. Timothy Ferris[38], for example, suggests that quantum cosmologists look at three fundamental problems: that of a first cause, that of something coming from nothing, and the issue of infinite regress. The philosophical cosmologies face with serious problem. Everything in the universe being a part of it cannot be the cause of it. It leads to a religion question.

The Bible starts with Genesis. God created the universe in six days. The physicist Frank Tipler pointed out in his book The Physics of Immortality: that "Either theology is pure nonsense, a subject with no content, or else theology must ultimately become a branch of physics. The reason is simple. The universe is defined to be the totality of all that exists, the totality of reality. Thus, by definition, if God exists, He/She is either the universe or part of it. The goal of physics is understanding the ultimate nature of reality. If God is real, physicists will eventually find Him/Her."[39] It seems God might be non-universe.

In the opinion of the physicist Charles Townes, the question of origin seems always left unanswered if we explore from a scientific view alone[38]. It is a common issue for science, philosophy and religion. Can we sum up all kinds of cosmologies to work out the solution? Nowadays, it is conceded that the universe is not perfectly isotropic or homogeneous. All cosmologies agree that the cause of the universe should not be the universe itself or a part of it. It is time to explore non-universe.

II. Analysis

Based on Hubble's discovery, the big bang theory is the most acceptable cosmology. The big bang cosmology postulates that all matter in the universe was at one time located at a point in space, and then the universe would have a singularity. At the beginning of the universe, time is zero (t=0). What event had happened at t=0? Or what is the "first cause" of the universe? Let's assume the unknown event is "x".

The boundary conditions of the beginning of the universe are:

1. There was no universe before the big bang.
2. The universe existed after the big bang.
3. The x event happened at the big bang.

This model can be described as following:

Nil (t<0) → Big Bang (t=0) → Universe and "x" (t>0).

A pure mathematical equation is able to represent this model at t=0.

$$0 = U + x \tag{1}$$

Where U is the universe and x is the unknown event.

One can easily to solve the eq.(1) and get the result.

$$x = -U \tag{2}$$

The unknown event is negative universe. According to the postulation of the big bang cosmology, the negative universe should be the so-called singularity. There is a simple mathematical function for singularity.

$$p = \frac{1}{x} \tag{3}$$

This function has a singularity at x=0.

The first boundary condition above tells us

$$\lim_{t \to 0} x = 0 \tag{4}$$

Where *t* is the time.

Thus,

$$\lim_{t \to 0} p = \lim_{t \to 0} \frac{1}{x} = \infty \tag{5}$$

The ultimate origin of the universe started at about 15-20 billion years ago. From then on, the universe is expanding for a long time continuously. Therefore, the singularity should be very far away from us. Our reference framework is the earth. It is reasonable to believe that the position of the singularity is very far away from the earth. Thus, p in the eq.(3) should be considered as the position function of the negative universe with respect to the earth.

After having the position function of the negative universe, one can compute its surface.

$$S = \int p dx = \int \frac{1}{x} dx = \ln|x| + C \quad (6)$$

Where S is the surface of the negative universe and C is constant.

Furthermore, one can derive the volume of the negative universe, too.

$$V = \int S dx = \int (\ln|x| + C) dx = |x| \ln|x| - |x| + |x| C + C_1 \quad (7)$$

Where V is the volume of the negative universe and C_1 is constant.

One can obtain the value of S and V from the boundary conditions.

Substitution of eq.(4) into eq.(6), one can have

$$\lim_{t \to 0} S = \lim_{t \to 0} (\ln|x| + C) = -\infty \quad (8)$$

The minus sign represents the negative universe.

Substitution of eq.(4) into eq.(7), one will obtain

$$\lim_{t \to 0} V = \lim_{t \to 0} (|x| \ln|x| - |x| + |x| C + C_1) = C_1 \quad (9)$$

Again, the constant C_1 can be solved by the boundary conditions. At the big bang, the volume of the universe is zero. By balancing the volume between the universe and the negative universe at the big bang (t=0), the volume of the negative universe should be zero as well. So that, the eq.(9) becomes

$$\lim_{t \to 0} V = C_1 = 0 \quad (10)$$

III. Discussion

The eq.(2) is the significant breakthrough. There is non-universe or negative universe. The eq.(10) reveals that the negative universe is a singularity. It is the theoretical proof for the postulation of the big bang cosmology. The redshift of galaxy light which was discovered by Edwin Hubble in the 1920s is the observation evidence for the expanding universe. Both theoretical and experimental results are able to prove that the negative universe singularity is the solution for the ultimate origin of the universe.

The eq.(5) tells us that the negative universe singularity is at infinitive position away from the earth. Although human beings could not observe the negative universe singularity, the theoretical calculation results have proven there is an edge and outside of the universe. It is common sense that the edge and the outside of the universe must not be the universe itself. The negative universe is non-universe. Hence, the negative universe should be the edge and the outside of the universe.

The eq.(8) shows that the negative universe has minus infinitive surface. The edge can cover the whole universe no matter how huge it is. The minus sign represents the negative universe. It is easy to understand that the edge of everything can cover the whole lot of itself.

The eq.(10) indicates that the volume of the negative universe is zero. This is contrary with traditional idea. The universe is immensely huge that the outside of it might be bigger than it. The fact is negative universe is a singularity so that our universe does not have any outside of the edge. From eq.(10), one can conclude that our universe is unique.

In a word, the negative universe model overcomes the barriers for all existed cosmologies. Scientific cosmologies will accept a singularity without the laws of physics. Philosophical cosmologies will satisfy with the universe comes from nothing with a cause but not itself. And theologies will proudly announce God is not a part of the universe.

When Einstein was writing his theory of general relativity in 1916 the prevailing feeling that the universe was static was so strong that when his equations indicated that the universe should be expanding, or contracting. The important issue is whether the gravity can reduce the expanding rate or not. By balancing the expanding rate, he introduced a cosmological constant to produce a universe at rest. However, he could not explain the problem that something is making the universe accelerate. The negative universe model offers the opportunity to improve the theory of general relativity. The acceleration comes from negative universe.

P. James E. Peebles suggested there must be some sort of unknown dark matter[32]. The dark matter would increase the gravity of the universe if it exists and reduce the expanding rate. It is contrary with accelerate expanding universe. The negative universe model opens another chance for further investigation to unknown dark matter. The dark matter could be the negative universe singularity.

Edward Tryon et al realized that the universe might be created from nothing[29-31]. They had tried to discover the cause of the creation but failed. The negative universe model gives a theoretical support for their postulations. The negative universe singularity created the universe.

Stephen Hawking et al described a black hole picture applying a series of laws of physics[13-28]. All the known laws of physics are able to explain the evolution of the universe but not for the creation of it. Any black hole being a part of the universe if it exits cannot be the cause of it. This is why the laws of physics break down in singularity. On the other hand, the gravity of the early universe should be greater than a black hole if it exits. The Hubble telescope has observed the light from the early universe. The early universe could not prevent the propagation of light why a black hole can. It is clear that the gravity is not

the reason. The negative universe model provides the reason to overcome this problem. The negative universe singularity can eliminate anything in the universe including light.

Vilenkin et al imagined the many worlds or multiverse situation[33-37]. However, they could not distinguish the edges between the many worlds. The negative universe model is able to give them the hints. The edge of the world should be non-universe or negative universe.

The negative universe model is also a reason to believe God. Although human beings cannot see negative universe, it exists. Human beings ought to imagine that God is non-universe and powerful to create and eliminate the universe.

Let's sum up the theories above. All existed cosmologies have their own advantages. Human beings develop many theories from different viewpoints to describe the beginning of the universe. The correct answer for the fact should be only one. A theory should obtain the only one correct answer for the fact if it is correct. The negative universe singularity has consensus with all the existed cosmologies perfectly. The negative universe singularity is the theoretical proof for Hubble's discovery. Vice versa, Hubble's observation is the experimental evidence to prove the negative universe model. The negative universe singularity is the conclusive solution for the ultimate origin of the universe.

IV. Conclusion

There is a negative universe singularity without any law of physics. It is non-universe. It is the edge of the universe. It is at the infinitive position away from the earth with minus infinitive surface and zero volume. And it is also the first cause of the universe. Our universe is unique without any outside of the edge.

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