Metaphysics of the Cosmic Singularity

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Einstein's theory of general relativity has already made the process of cosmic influence the comparative result between space-time and energy or matter. When the expansion of the universe was discovered at the end of the 1920s, relativistic perceptions showed that it was necessary to refer to a beginning that is not preceded by another beginning which represents an accompanying semi-spatial point and a quasi-temporal moment of time and this point also carries a huge mass of energy. Through this state; the so called term singularity had been expressed where the great explosion began and the expansion or the global inflation occurred. The singularity is a point; which is compressed to the maximum extent of it being physically condensed. According to relativity, the density and energy of matter are estimated to be infinite within this point where time and space are absent or zero.

The aforementioned is derived from general relativity where the singularity is the product of this theory, and at least it is considered according to the models of cosmic expansion and big bang. The value of energy in terms of the singularity remains as an infinite value and from the beginning, the effects became enormous and its effects are still apparent today. This is because its limits or its effects are unknown, including the moment at which it will terminate. Moreover, physicists have not yet confirmed the precise cosmic expansion's destination, whether it will reach a certain limit until a point of regress or will the cosmic expansion continue infinitely? Or will it take another form?

The physicist and the Belgian pastor; Georges Lemaître is considered the first to deduce the existence of this initial point relying on general relativity equations and the use of Hubble's discoveries regarding the space between galaxies. In his 1927 paper, he interpreted Doppler's shift as evidence of the expansion of the universe as he worked on solving the equations of relativity, predicting that the universe was expanding. This idea seemed rather strange at the time, until it was said that Einstein protested and said “Your mathematical equations are correct, but your physics is horrendous”. In 1930, Lemaître suggested that our expanding universe had begun from an infinitesimal point called the ***primordial atom***, which is later called the singularity, from which the great explosion has begun, then expanded or inflated as interpreted by the Hubble law.

There is no doubt that the singularity has puzzled contemporary cosmologists. If we were to reverse the cosmic expansion until we reach the very beginning, it will mean that time and space will be transformed into that singularity without exceeding it because the entire cosmic effect had began from this cosmic point before the existence of time and space.

It is ironic that the singularity is associated with general relativity yet contradictory to it as the singularity reveals the inconsistencies of general relativity and therefore cannot be applied to it. Relativity predicts that the singularity is the point at which temperature, density and bending of space are infinite, hence why physicists have considered it to be inconsistent. If we go back in time, the particles gradually converge together until we reach the point of singularity, at which the energy should be infinite according to the accepted physical laws. For example, since the distance between particles at the singularity point is zero, so is the gravitational force between the particles to be infinite according to the laws of gravity, as the force is inversely proportional to the square of the distance between two bodies.

This problem is not confined to the cosmic singularity at the time of its initial existence, or what is known as the conditions of the Big Bang or what occurs inside black holes as it also possesses its own singularity. In both cases, a general relativity equation is unable to solve this.

Both of the singularities have common characteristics whether it is in the beginning of the universe or inside a black hole, the singularity is obtained by a great force of gravity. When physicists refer to the cosmic singularity, they do not distinguish its physical density from that of black holes although there are apparent differences between them and in both cases, there is the singularity and a huge gravitational force but in actuality what occurs is completely in opposition between both singularities. As the singularity of the black hole has the nature of consuming everything around it due to the huge gravitational force, while the opposite occurs in the case of the cosmic singularity, as it generates a huge explosion, pushing everything outwards.

The history of black holes dates back to 1783, when John Michell published a paper researching the stars in terms of their size, dimensions and mass, and had measured the effect of their gravity on the light emitted from their surfaces, based on the particle theory of light as presented by Newton. In addition to this, he found that there could be stars with a density not less than the density of the sun and have diameters of more than (500 times) as much as the diameter of the sun, where gravity will bend the light inward without letting it reach us and as a result appearing dark or invisible. This phenomenon is called the dark stars. In 1796, the famous sports scientist Pierre Simon Laplace published a book in which he made a research on "invisible stars" and it came to resemble Mitchell's idea without knowing what the latter did. As he revealed the effect of gravity on making some stars dark or invisible because light isn’t able to escape from the strong gravity. But this idea disappeared from the edition of his book in (1808) and also from subsequent editions, this was after the publication of the research of Young and Fresnel, which proved conclusively that the light consists of waves and not particles subjected to gravity.

But During the 20th century, the German astronomer Karl Schwarzschild introduced the first serious scientific attempt to deduce the black holes of general relativity (1916), after Einstein published his theory in the same year. The latter expressed his disapproval of the new idea. In 1939 he published an explanation denying such holes. But a number of scientists in the 1960s found what Schwarzchild has described to be the right thing, including Stephen Hawking, Roger Penrose, Freeman ***Dyson*** and John Wheeler, who called these stars the black holes. Although many physicists considered these holes fictional, they were welcomed during the 1990s by the growing evidence around it.

It is known that the black hole is created from a star whose mass is very large, sometimes this mass is ten times the mass of the sun or more, which makes the heart of the star very dense, so the gravity will increase and the star becomes ready to turn into a black hole, the formation of the black hole starts after the energy depletion of the thermal nuclear interactions of the star. The force of gravity in the heart of the star overcomes these reactions, which were resisting it. Then the matter is pulled inwards and the star shrinks until the black hole is formed and begins to swallow everything around it due to this huge force of gravity.

However, the black holes are still theoretical without any direct empirical evidence. According to relativity, it can never be seen, since it is impossible for anything, even the light, to escape from it under the effect of its huge gravity, which makes it very difficult to be proved and sensed. But there is a way introduced by Stephen Hawking; he mentioned that it was shining on him at a moment of discovery that was similar to inspiration (1974). He tried to prove that these black holes radiate some light currents without being completely dark, depending on the quantum theory.

According to quantum theory; Space fields are not zero for uncertainty as the Space is full of creation and vanishing processes of opposite conjugal particles, which is known as estrangement or illusion, where they appear as opposite pairs, but the particles rapidly dissolve each other, which also happens in the area near the black hole, as there are hypothetical conjugal particles around the hole, including the photon-related pair. The negative energy density of the black hole bends the space-time around it, which makes the light rays separate from each other, unlike the positive energy density that collects the rays as visible. Which mean that, the enormous potential of the gravity of the hole can inject energy into the pair of photons and separate them from each other in the space area adjacent to the black hole, as one of them can be pulled into the hole before his dedication with his counterpart, while the other one escapes away, so a constant stream of radiation is emitted from it to the outside, making the black holes radioactive. This phenomenon generates what is known as hawking radiation in relation to Hawking, also called Bekenstein radiation in relation to Jacob Bekenstein. The black holes are therefore not completely black.

This is what Hawking and Bekenstein predicted, that the black holes produce radiation constantly making the energy of the hole or its mass decrease, and the less the mass of the hole the higher its temperature, and thus the emission of radiation continue till it evaporates completely and become like other normal regions in the universe.

However, until now, no one was able to see these holes or to sense their supposed radiation according to the mathematical calculations of Hawking, neither photonically nor thermally. Astronomers searched for such radiation, but to no avail. They did not find any of these concentrated radiations in the range of Gamma rays. so, its value is due to the mathematical analysis with some uncertain evidence, therefore they are acceptable to most physicists till now.

The resemblance between the initial cosmic singularity and the black hole singularity made some people suggest that the entire universe might be in a giant black hole, as John Wheeler had said. Physicist Lee Smolin also saw that the conditions of the great big bang were similar to those of the black holes, as a result he suggested that each black hole is a nucleus of a new world comes into existence through a huge explosion, but it is permanently invisible to us due to the horizon of the black hole.

In contrast to Wheeler and Smolin, all these similarities between the conditions of the initial cosmic singularity and the black hole singularity didn't explain to physicists the reason for these similar conditions, as These two singularities have a significant difference in their consequences; the black hole singularity swallow everything but it doesn't explode or expand, while the cosmic singularity explodes and expand , even the radiation transmitted by the black hole singularity ,according to the Hawcking calculus, is so small that it is impossible to detect empirically , so it is quite different from radiation domination that happens in the case of cosmic singularity .

It was said that it is still unknown if the strong gravity that works on bending the space leads to an increase in the disorder or entropy or to its declination. The British sportsman Roger Benrose sees the entropy falls, while Stephen Hawking sees the opposite, thus the issue remains unclear.

This condition is reflected on temperature, as entropy is directly proportional to temperature rise and vice versa if it decreases. According to this connection, either the black hole singularity has a high entropy, which means that its temperature is high, which is not different from the universal singularity as recognized, or has a low entropy and thus a low temperature also. In the first case, there will be no differentiation between the hole singularity and the cosmic singularity, but in the second case, an implicit difference will be found between the two singularities, as the hole singularity is sometimes described to be so cold that it can be close to the absolute zero. For example, the black hole whose mass is three times larger than the sun, has a very low temperature, as it is higher than the absolute zero by about one hundredth of a million degrees. While the cosmic singularity is extremely hot, with no equivalent thermal phenomena in the universe.

This means that there is a reason for physicists to accept the state of the contradiction between the two singularities if the cosmic singularity and its following conditions are considered to carry the heat energy which is not borne by the force of gravity; before and after its liberation from the unity of the known forces of nature therefore, the explosion or expansion has occurred due to the superiority of thermal energy on gravity. This explains why the explosion or expansion occurred in the case of the conditions of the cosmic singularity, while the opposite occurs in the case of the hole singularity. If we rely on the theory which says that the universe started very cold and not as hot as it is, or that the singularity in it has been characterized by extreme cold, in this case the conditions of the cosmic singularity will be similar to the conditions of the black hole singularity, therefore there won't be an explosion in the first universe or expansion and enlargement. If there are any considerations that may restore confidence to say that the universe has a cold birth, or that it is characterized by isolation and ranging between coldness and warmness through continuous cycles without interruption.

We have already said that relativity has not been able to solve the problem of singularity, either in the case of black holes' singularity or the initial cosmic singularity. Mathematically, the singularity is characterized by infinite energy and density. In the case of original cosmic singularity, expansion assumes singularity as a starting point, and the singularity requires infinity and mathematical dilemmas. Therefore, relativity is negated at this unique point.

The problem of the primary singularity is not confined to the mathematical aspect of physical analysis There is another philosophical problem that is related to the cosmic theories in general and the general relativity in particular. The metaphysical question arises: from where did the cosmic singularity come into being and how was it born, carrying in it the energy of the entire universe? Relativity had nothing to talk about before this complex singularity, because It can't speak about previous space and time which are coupled with compressed energy at the highest levels of cosmic pressure. Time and space are associated with energy and matter, and if it is not possible to divide the singularity or turn it into a simpler state, this will lead to infinite sequence, as it is not possible to talk about previous time and place, therefore there is no other way than to assume that the singularity was born from Total nudity, by mathematical expression: it was born from the absolute zero.

There is no doubt that the era of Einstein has been talking about what precedes the singularity as it is a philosophical and metaphysical issues that have nothing to do with science. Science is dependent on the existence of physical reality, and that the latter is made up of space-time and energy, if this form is zero, there is no physical reality, and therefore there is no room to be aware of the following.

There is a concern about how pure zero or zero can generate something superfluous from massive energy at a very narrow space from the space point, suddenly without the passage though evolutionary mediums that allow for the massive gathering of energy, and then assume something from the vast space? How can a point bear everything universal at once, in addition that it is indivisible and unrecoverable? So, this point or singularity is not simple, as it carries the energy of the whole universe with its different forces, so how it was suddenly born from nothing? How can the zero generate a number? such as the generation of a very complex composite, as it carries an infinite number of fractures?

Assuming that the singularity is a single thing, and at the same time it has a very complex installation of huge energy, it means that the zero has produced infinity without passing through the upward digits ...?

According to relativity, it is not possible to assume anything from space and time preceding energy and mass. Thus, the presence of the singularity with its huge energy is the first beginning of the space-time. It represents a universal time-space free from actual dimensions. The singularity is the first undivided and nonreversible space point, though it holds the energy of the whole universe.

Ironically, all of this energy came from zero without dismantling. There is no room for assuming that the singularity has very little or very cold energy.

The result is that creating the universe from nothing means an infinite creation from the absolute zero. Nothingness equals zero, and the existence of a thing is equal to one, but this thing is not simple when it carries this huge amount of energy, so one here is an expression of infinity, which means that the infinite one can come from zero, the process of passage from nothing to existence is the passage of an infinite series of energy, which makes the problem metaphysical.

Thus, according to the theory of the cosmic singularity, it wasn’t shown from where the great energy came into being, despite the absence of space-time dimensions. In this sense, it raises metaphysical problems, which cancel in this way the equations and scientific laws, as long as they have no meaning obtained according to the physical understanding. So, it is not surprising that physical science begins with its known laws from the moment after the singularity. The first moment considered in physics is the time of Planck (10 seconds), which is the least calculated period of time. In terms of the history of the universe, Planck's time represents the first physically determined moment without being preceded by a single independent moment. The temperature this time is about (10 Kelvin), and in another estimate; the the maximum global temperature is assumed to be (10 Kelvin). At this moment, gravity began to be liberated before the rest of the known forces of nature (electromagnetic and weak and intense nuclear power), then the universe began to expand, cool down and gradually expand with the passage of time.

It's acceptable for physicists to consider the universe at the time of Blanck is the beginning of the Great big bang. But we are surprised when physicists Lloyd Mutz and Jefferson Weifer mention that cosmologists began their studies when the universe was 10 seconds old. This is the beginning and cannot be reversed, as in their opinion, it represents the moment of the great big bang.

In fact, this beginning is not convincing, as It was preceded by the era of Planck, from which the universe began to expand after the liberation of the force of gravity and its independence, which means that in this era the space-time began to appear and expand with its four dimensions. According to physical analysis, another independent moment has appeared after this era when the age of the universe became (10^{-35} seconds), where the temperature decreased till it became (10^{27} Kelvin), then the strong nuclear force was released from other forces. This period is not the beginning of cosmic development or the great explosion (big bang), as All of this depended on the liberation of space-time, which represents the origin of cosmic expansion, which is the reason for liberation of the force of gravity and its independence, as happened during the first period of time, represented by Planck time. Before that time, it is assumed that nothing special happened except the existence of the singularity with its infinite energy.

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The problem of singularity has led many theories to circumvent it within various virtual manipulations, in order to avoid entering the maze of metaphysical issues, as well as to work in accordance with the accepted laws of physics without fault. The circumference and exile conditions have taken various forms, including quantum leap theory, which assumes that the universe emerged as a single jump from the continuous space or space-time based on the quantum theory. The universe, according to this consideration, has come from nothing and the origin of the idea dates back to World War II, and was developed in the early 1970s, until recently crowned by Lawrence Krauss. There is no doubt that this theory has gone beyond the considerations of general relativity, based on the space-time of Minkowski which is free from gravity. It’s associated with the special relativity and its Euclidean geometry.

As the theory of the non-specificity of Hartl and Hawking, assuming that the universe arose without a specific beginning and no specific time, the beginning exists in the middle of a set of equal points without a particular center, in addition that the time was just a spatial connection, as there is no existent time or specific singularity to say that: Here the blowing in the fire began or the big bang. This theory is based on both relativity and quantum. Based on relativity, time has been eliminated by turning it into a place, and by relying on the quantum, any singularity of the universe's creation has been eliminated in accordance with the principle of uncertainty. The beginning begins from the moment of Planck's time, before which there was no specific moment of time or beginning. There are points that cannot be determined according to the potential of the quantum, and they express the spatial quadrant connection before the beginning of time.

But it is known that Planck's time represents the moment when gravity was liberated from other known forces of nature. It is therefore necessary that the spatial extension begins from this era, not before it, unless we are talking about the empty space-time of Minkowski, which has no gravity but this was negated by general relativity.

There are also theories of interaction that assume that our universe was created by collisions or combination of pre-existing objects as shown by models of cosmic inflation, without the need to assume singularity. Some theories believe that our universe is the result of a huge explosion caused by the collision of two universe bubbles that resulted in our present universe, as a group of string theory speculates. Another theory assumes that the explosion was caused by a combination of very heavy particles called Unitons. The nucleus of neutrons - protons and neutrons - was created from this union, while a great explosion was created which became the origin of the universe. This theory is attributed to physicist Lloyd Motz, he thought that it is possible that this scenario will be repeated in the future without the need for an assumption of initial singularity. But this estimate is not supported by basic physical theories, such as relative and quantum theories, As we know that relativity returns the universe to the singularity as a last point without extension or spacing between particles or combination between them. Quantum refers to the state of quantum oscillation according to the principle of uncertainty, This makes the universe emerge from nowhere.

There are also theories of cosmic rebound, which assume that the universe has eternal cycles through which it passes by a point of rebound without having to take the idea of singularity. When we go back in time, the universe reaches its lowest size and then expands again. The Russian cosmologist Zeldovich (1914-1987) saw the universe expanding and shrinking and then exploding again and so on indefinitely, each time increasing in size and lasting more. This theory came to solve the problems of the Big Bang Theory, but Zeldovich admitted in his theory that he had failed and that the refractive universe was not a solution to the problems of the explosion, but they increase by using it.

similar attempts were repeated by the owners of the string theory, using a very narrow and finite physical time and space with a mass and energy to carry them, this is the time of Planck and the distance of Planck or its size as far as the extremes of the space-time leap. Thus, every movement, change and influence cannot go beyond this limitations of planck. Through these limitations, the infinite values can be eliminated, in addition that the gap of the appearance of the incident from nothing can be eliminated.

Recession theories require that the universe be eternal without a definite beginning or end.

In addition, there is the theory of cosmic stability (the fixed state), which belongs to a number of physicists like; Fred Hoyle, which does not admit the existence of a universal singularity, but admits that the universe is infinite in its time and space, and in this sense it does not need a singularity assumption or a great explosion. This theory was attractive and popular among physicists for decades before it was abandoned since the mid-1960s, after the discovery of cosmic background radiation suggesting that the universe had a beginning which is represented by the singularity.

These are all the theories that accepted the theory of the universal singularity or denied it, all of them represent the assumed scenarios and guesses without possessing substantial physical evidence.

The reference

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