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James Webb Telescope and deciphering the hidden problems of physics

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Abstract:

Ever since the earth was thought to be the center of the universe to this day which humans will deploy the James Webb Telescope at the equilibrium point between Earth and the Sun to better understand the universe, man has gone through a tumultuous path of belief and science to know and explain the universe. But cosmology in its scientific sense has been started when Galileo looked at the sky by his telescope, and man's beliefs about the planets and the sun were shaken. At the beginning of the twentieth century, mathematical equations were first used to explain the universe. In the 1920s, it was thought that the compatibility of cosmic equations and observations could provide scientific answers to cosmological questions. It gradually became clear that if this consistency exists at the macro level, there are still problems in the details whose answers are more doctrinal than scientific. Today, scientists hope that deeper observations by the James Webb Telescope could help solve some cosmological problems. But until we find a scientific and accurate explanation for these problems in the foundation of physics, it seems impossible to solve them.

Keywords: Wave Function, Field Excitation, Big Bang, Gravitational Singularity, Telescope, Cosmic Inflation, Sub-quantum energy

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The beginning of cosmology

At first glance, the sky looks very close and the ancients thought the sky was what it was seen, nevertheless, the sky has always been full of mystery for man, and humans thought and felt there is a connection between human destiny and celestial changing. The explanation of this relationship can be seen in ancient myths, religions, and philosophy which included the origin and the end of the universe. Although none of these explanations had scientific or empirical support, but it could satisfy human curiosity and reduce his anxiety. Many of the physicists' views on the origin of the observable universe is more an interpretation between belief and philosophy than a scientific opinion. [1] The first truly scientific theory was Copernicus's model of the Solar System was published in 1543. In 1609, two important events in physics arose that man's attitude and perception changed of the sky. Kepler published his first and second laws and showed that the orbits of the planets around the sun are elliptical, and the closer the planet gets to the sun, it moves faster.

Galileo constructed his own telescope and looked up at the sky and noticed the surface of the moon as being uneven, the surface of the sun has spots, and Jupiter has a number of moons, and observed the ring of Saturn. This historic event, in which theoretical advancement occurred almost simultaneously with cosmological technology, is one of the most amazing developments in the history of physics, which was also repeated later. Please note the relationship between the events and their dates in this article. It was possible to calculate the orbits of the planets with Kepler's laws, but it was not possible to detect the uneven surface of the moon, 79 Jupiter moons, or sunspots by Kepler's laws, and it was only possible to see the sky, which started with the Galileo Telescope. In other words, the universe is a cosmological laboratory to test the correctness or incorrectness of cosmological theories and equations. Although Kepler's laws are universally valid, they are very difficult and time-consuming to work with because they have an integral form and must be observed and calculated for each specific case. Kepler's first law states that the orbits of the planets around the sun are elliptical. But the large and small diameters of each of these ellipses must be obtained by complex observations and calculations. This is exactly what Kepler did for Mars, which took several years. [2]

In 1687, Newton formulated the universal gravitational law and expressed Kepler's laws as a differential equation. This equation can be applied to all celestial bodies and made celestial mechanics an important part of the knowledge of physics that physicists reached to astonishing progress. In addition, the universal gravitational law introduced one of the most fundamental constants of physics, which is the universal gravitational G constant. Universal constants of physics determine the limits and regulate physical events in the universe. If their values were slightly different, the universe would be different. [3]

After Newton, none of the physical discoveries were as significant as Maxwell's equations. One of the theoretical results of Maxwell's equations was the calculation of the speed of light, which at that time was not considered a universal constant. Because the speed of light was thought to be constant relative to the ether reference frame, the motion of the light source or reference frame relative to the ether changed the amount of light velocity. The failure of the Michelson-Morley experiment in 1887 called into question the absolute ether reference frame. The Mount Wilson Observatory was established in California in 1904 and began its observations in 1908 with a 60-inch telescope. [4] In 1905, Einstein proposed the theory of special relativity, and by refuting the absolute reference frame of ether, by proposing the principles of special relativity, he stated that the laws of physics are the same for all inertial reference frames and that the speed of light is constant for all inertial observers in a vacuum. And it does not depend on the movement of the light source. The speed of light was then accepted as a universal constant. [5]

Cosmological Equations

In 1915, Einstein published the theory of general relativity, and in 1917 he decided to explain the mathematical structure of the universe using the equations of the field of general relativity. He realized that according to the equations of the field of general relativity, the universe could not be steady, it must be expanding or contracting. So he added a constant called the cosmological constant to make the radius of the universe to be stable. [6] The cosmological constant appears in Einstein's field equation in the form of:

$$R_{\mu v} - \frac{1}{2} g_{\mu v} R + \Lambda g_{\mu v} = \frac{8\pi G}{c^4} T_{\mu v} \qquad (1)$$

Or:

$$R_{\mu v} - \frac{1}{2} g_{\mu v} R + \Lambda g_{\mu v} = k T_{\mu v} \qquad (2)$$

Where $\boldsymbol{R}_{\mu v}$ is the Ricci curvature tensor, R is the scalar curvature, $\boldsymbol{g}_{\mu v}$ is the metric tensor, Λ is the cosmological constant, G is Newton's gravitational constant, c is the speed of light in vacuum, and $\boldsymbol{T}_{\mu v}$ is the stress–energy tensor. Greek capital letter lambda Λ is the cosmological constant. Cosmological constant is the value of the energy density of the vacuum of space.

In 1917, a 100-inch telescope was installed at the Mount Wilson Observatory. In 1919, Eddington confirmed general relativity by photographing solar eclipses, and Edwin Hubble started his job at the Mount Wilson Observatory. In 1921, Einstein was awarded the Nobel Prize in Physics, and relativity became more and more popular among scientists. Alexander Friedman revised Einstein's cosmological equation, assuming that the radius of the universe was not constant, and in 1922 proposed a new equation now called Friedman's cosmological equation. Einstein first misread Friedman's equation, but he could not get it wrong and accepted that the equation was compatible with general relativity. [6] Friedmann showed that there exist expanding solutions that are unbounded with hyperbolic geometry. The differential equations that he derived were:

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right] R^2 = -kc^2 \qquad (3)$$

Thus physicists became curious about cosmology and whether the universe is steady or expanding. One physicist, Georges Lemaster, first stated in 1927 that the beginning of the expanding universe could be traced back to a point called the "early atom”. In 1929, Hubble with cosmic observations and calculations of the redshift of galaxies showed that galaxies are moving away from each other, and away from Earth, and the farther away they are, the faster they move. In other words, the universe is expanding, which could be explained by Friedman's cosmological equations. [6] After Hubble discoveries on the universe's expansion, Friedmann’s equation was as follows:

$$\left(H^2 - \frac{8}{3}\pi G\rho\right) R^2 = -kc^2 \qquad (4)$$

Where $H = (\frac{1}{R})\frac{dR}{dt}$ is Hubble "constant", G is the gravitational constant , ρ is the universe mass density , c the speed of light and the parameter k is 0 for Euclidean Geometry or flat space, +1 , elliptic space and -1, hyperbolic space. One can write $\rho = \rho_0(R_0/R)^3$, where ρ_0 and R_0 are the present day values of the density and radius of the universe.

The results of Hubble's cosmic observations were published when in the scientific community, the steady state universe and the expanding universe were discussed. In addition, atomic spectra and relativistic Doppler effects were known. The speed of light was accepted as a universal constant and the ether reference frame was not valid. If one of these scientific requirements was not available, Hubble's perception of the behavior of galaxies was different and was interpreted differently. Man interprets all physical phenomena according to his accepted beliefs and concepts. For example, the efforts and sufferings of scientists to prove are considerable proving that the earth is not the center of the universe. For example, the efforts and sufferings of scientists to prove Earth is not the center of the universe are remarkable.

Under those circumstances, Hubble's observations were strong reasons to confirm the expanding universe. Fans of the steady state universe, including Einstein and Fred Hoyle, also embraced the expansion of the universe, but they claimed that new matter was constantly being created by the expansion of the universe and the density of matter remains constant over time. In any case, both hypotheses had religious approaches.

In 1948, George Gamow predicted the cosmic microwave background (CMB). In contrast, fans of the steady state universe, In Einstein's cosmological equation instead of the cosmological constant, replaced a parameter for mater production to provide mathematical support for steady state universe theory. [7] Einstein believed that the universe was eternal and by spontaneously producing a constant amount of matter, the universe expands from the outside. [8]

$$\boldsymbol{R_{\mu v} - \frac{1}{2} g_{\mu v} R - C_{\mu v} = k T_{\mu v}} \quad (5)$$

In 1964, cosmic microwave background (CMB) was accidentally discovered by Arno Penzias and Robert Wilson, many cosmologists have accepted the Big Bang theory, and the theory of a stable universe was pushed to the margins. [6] According to the Big Bang theory of the universe, about 14 billion years ago, an explosion of a singularity with a volume close to zero began with an infinite and extremely hot density. Because this assumption is inconsistent with known laws of physics, they assumed that the laws of physics do not work in singularity. The Big Bang theory, with all its success, was fraught with problems until the theory of cosmic inflation was proposed by Alan Guth. Although inflation theory solves some of the Big Bang's problems, it has no definable mechanism for starting inflation and offers no explanation for ending it. Even some opponents of the theory of cosmic inflation do not consider it a scientific theory. [9] What is certain is that cosmic observations cannot be explained by existing theories. [10] Over the past decades, much effort has been made in both theoretical and experimental cases to eliminate this theoretical and experimental inconsistency in cosmology, one is to send a more powerful telescope into space, and the other is advanced experiments in laboratories, especially CERN.

Hubble Telescope with a mirror with a diameter of 2.4 meters is the most famous telescope that in 1990, it was placed in Earth orbit at a distance of 559 km. Its most important achievements are, help determine the age of the universe, discover the two moons of Pluto, determine the rate of expansion of the universe, and discover the black hole at the center of many large galaxies. On December 25, 2021, the James Webb Telescope with a 6.5-meter diameter mirror was launched to space and is supposed to be at a distance of 1.5 km from the earth, settle at the equilibrium point of the earth and the sun. In practical terms, the main difference between the Hubble Space Telescope and the James Webb Telescope is that the Hubble works on the visible spectrum but the web on the infrared spectrum. Hubble was able to image the universe up to 500 million years after the Big Bang, but James Webb will reduce that to less than 200 million years. The Web Telescope will study the history of the universe, from the first glows after the big bang, the formation of the first stars, the first galaxies, planets, and the origin of life, and systems such as the sun that are able to support life on planets like Earth. [11]

Just as the Hubble Space Telescope and other telescopes could not detect the moment of the Big Bang, neither can the James Webb Telescope. That is, the mystery of singularity and the cause of the Big Bang will remain unsolved. Solving such mysteries is basically not the job of telescopes. Because the telescope cannot theorize, theorizing is the responsibility of man. But the information needed for theorizing comes from the experiments, and telescopes are the human eye in the cosmos. After observation, it is the turn of thought, analysis of information, and conclusion.

Proponents of the Big Bang theory say; the universe began with the explosion of a singularity with zero volume and infinite density, and it was very hot. These two questions can be asked:

1 - How did you reach singularity?

Answer: According to Hubble's discoveries, we analyzed the universe from today to the moment of the beginning.

This answer is convincing because we do not know of any other method.

2- What was the singularity made of that was zero in volume and infinite in density and very hot?

Answer: the singularity is related to the Planck epoch, 10^{-43} seconds from the time of the Big Bang. There is currently no physical theory to describe such a short time. It is generally assumed that the quantum effects of gravity on physical interactions are predominant at this time scale.

The fact is that general relativity and quantum mechanics cannot explain gravitational singularity. That's why physicists focus on the entropy of the universe, which increases over time. Thus the universe was at the highest level of order in singularity and before the explosion, and after the explosion, it goes in the direction of disorder. But there is a relationship between temperature and entropy. So why was the entropy zero in the Big Bang singularity? This definition of singularity is inconsistent with observable facts. How could all these galaxies and stars have formed from the explosion of a volume smaller than an atom and very hot? In another interpretation, some physicists claim that the universe came into being out of nothing. [12]

If this is a religious belief or a philosophical allegory, there is no problem. But when they want to use it as a scientific explanation, it is unacceptable. They say the laws of physics do not work in singularity. If the singularity is a physical being and is composed of matter and energy, should obey the laws of physics. Unless the known laws are defective, in which case we must find the defect of these laws, or we do not know how to use these rules to explain the Big Bang. In any case, we have no way, except to use these known laws to explain the Big Bang, and wherever we run into problems, we review the laws of physics.

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What are the hidden problems of modern physics?

In the late nineteenth century, physicists have dealt with two newfound phenomena, one was particle on a microscopic scale, and another was high speed close to the speed of light, which could not be explained by classical physics. Quantum mechanics was established to explain the microscopic world and special relativity for high speeds. Physicists had no problem with special relativity, and the problem of modern physics was to combine quantum mechanics with relativity. Combining quantum mechanics with special relativity was not simple though, and its history is full of despair and hope and unfinished success, it is the result of the continuous work of many physicists that is the last century, each generation followed the work of the previous generation, and it is still not without ambiguity. But the combination of quantum mechanics with general relativity has been inconsistent from the beginning, and there is still no sign of promising success. It became clear over time quantum mechanics are more complex than which was thought, so that Feynman said: “I think I can safely say that nobody really understands quantum mechanics”. [13]

Strange behavior in modern physics is not limited to quantum mechanics; it even exists in special relativity, but no one has paid attention to the hidden problem of special relativity if one noticed, has not mentioned it, or at least I'm not aware of it. Consider a few inertial observers that everyone is moving at different speeds relative to each other, one is at the train station, another on a moving train, another one in a car, or an airplane, and an observer on the spacecraft moves at a speed close to the speed of light, for all of them the speed of light is constant and equal to c. This is the hidden problem of special relativity which cannot explain what property is in the light or the observer that the speed of light is constant and equal to c relative to all inertial observers? If the observable universe came from the Big Bang, its laws are also taken from the Big Bang, and the intricacies of modern physics are intertwined with the Big Bang mysteries. Moreover, just as mass and energy are equivalent, there must also be common properties in matter and energy. Consider the pair production and decay of a particle-antiparticle where energy is converted into matter and matter are decayed into energy. In other words, fermions derive their properties from energy and, in decay, transfer them back to energy. [14] So it can be shown that the problems of the Big Bang and modern physics have common roots and are related to the physical properties of elementary particles. But in the standard model, the elementary particles are point-like and unstructured.

Fundamental particles

Theoretical experiences and laboratory observations showed the definition of a point-like for particles needs to be reconsidered. So the physicists tried to replace better definitions of dimensionless and unstructured particles. Two common interpretations of particles are field excitation, a purely mathematical entity, which has become a reality. However, physicists offer different views on the particle, because the question remains unanswered how a dimensionless point has properties such as electric charge and can withstand weight? [15] The characteristics of an object depend on its physical structure which eventually into the constituent particles it leads to, but the properties of particles are derived from mathematical patterns. For this reason, particles and quantum objects are described by their wave function. The wave function of a particle, such as an electron, has probable locations instead of a specific location. But when a detector enters the scene, and one is determined the location of the electron, the wave function suddenly collapses at that point and the particle is revealed. Thus, a particle is a collapsed wave function. Why observation causes the collapse of an extensive mathematical function and the appearance of a particle? This question has remained unanswered for nearly a century. [15]

In the 1930s, physicists discovered that wave functions of many single photons overall, behave like a single wave which is propagated by interconnected electric and magnetic fields, just like the classic image of light discovered by Maxwell in the 19th century. These researchers found they can "quantize" classical field theory, they restrict fields so that those can only oscillate in discrete quantities, called quanta of fields. Paul Dirac and others discovered this approach can be generalized to electrons and everything else: according to quantum field theory, particles are the excitations of quantum fields that fill the entire space. [15] Although quantum field theory is more fundamental, quantum field theory became the language of particle physics, because it allows researchers to calculate with extraordinary accuracy what happens when particles interact. In the 1960s, quantum field theory, including all known particles and their interactions, was proposed as the standard model for elementary particles. Although the standard model describes the three electromagnetic forces, the strong nucleus and the weak nucleus, it does not include the force of gravity. In the 1970s, to overcome the shortcomings of the quantum field in terms of gravity, string theory entered physics, and one-dimensional strings replaced point-like particles. One of the many vibrational modes of the string corresponding to the graviton carries the force of gravity. Proponents of string theory suggest that if we magnify the particles enough, we come to one-dimensional vibrating strings. However, if there are strings with extra dimensions, they are very small and cannot be identified laboratory, [15] at least they have not been identified yet. String theory also cannot solve the problem of modern physics, as did not solve yet. We need a new definition of a particle that can answer questions in all physical conditions. Such a definition can only be obtained from validated experiments and has properties that are also compatible with known laws of physics.

Particle and field

Particles are often talked about in physical books and articles, even the standard model is introduced with particle extensions. But in fact, according to the known laws of physics, the basic building blocks of nature are not discrete particles. Rather, they are like continuous fluids that are spread all over space and are called fields. The most familiar examples of fields are electric and magnetic fields, the waves of which are light, or electromagnetic waves in general, and the photon is a wave-packet of an electromagnetic wave resulting from the excitation of an electromagnetic field. The same process happens for other known particles. There is a field called the electron field that is spread across the space as a thin layer. Electron field waves are dependent on a packet of energy by quantum mechanics, and this packet of energy is what we call an electron. Similarly, there is a quark field and a gluon field. In fact, each particle is the concentrated field associated with that particle. This is the basis of quantum field theory: in a way, we have to attribute the nature of the particle too small changes in the fields. This analysis seems to be necessary for all forms of energy: they all originate from their underlying field, the amount of which, in small quantities, cannot be reduced by a certain amount, but can be changed in discrete increases. The underlying photon field is an electromagnetic field. Since there is a wide range of photons, and the difference between the photons is in their energy value, it is necessary to define its minimum specific value, this minimum specific value can be defined by examining the behavior of photons in the gravitational field.

Sub Quantum Energy (SQE)

As experience has shown, general relativity is very accurate. An international team of astronomers led by Michael Kramer of the Max Planck Institute studied the Double Pulsar system and modeled the exact arrival time of more than 20 billion clock ticks over a 16-year period. It turned out to be up to 99.99% consistent with the predictions of the theory of general relativity. [16] Therefore, experiments that are consistent with general relativity and the laws of quantum mechanics have high validity for citation and modeling. Changing speed, it loses energy (the reason for this is stated below), and its frequency decreases, which is called gravitational redshift. Its inverse opposite is also true. When a photon falls in a gravitational field, it gains energy and increases its frequency, which is called gravitational blueshift. The gravitational redshift (and blueshift) in addition to cosmic confirmations on Earth have also been confirmed using the Mossbauer Effect in the Pound and Rebka experiment. [17]

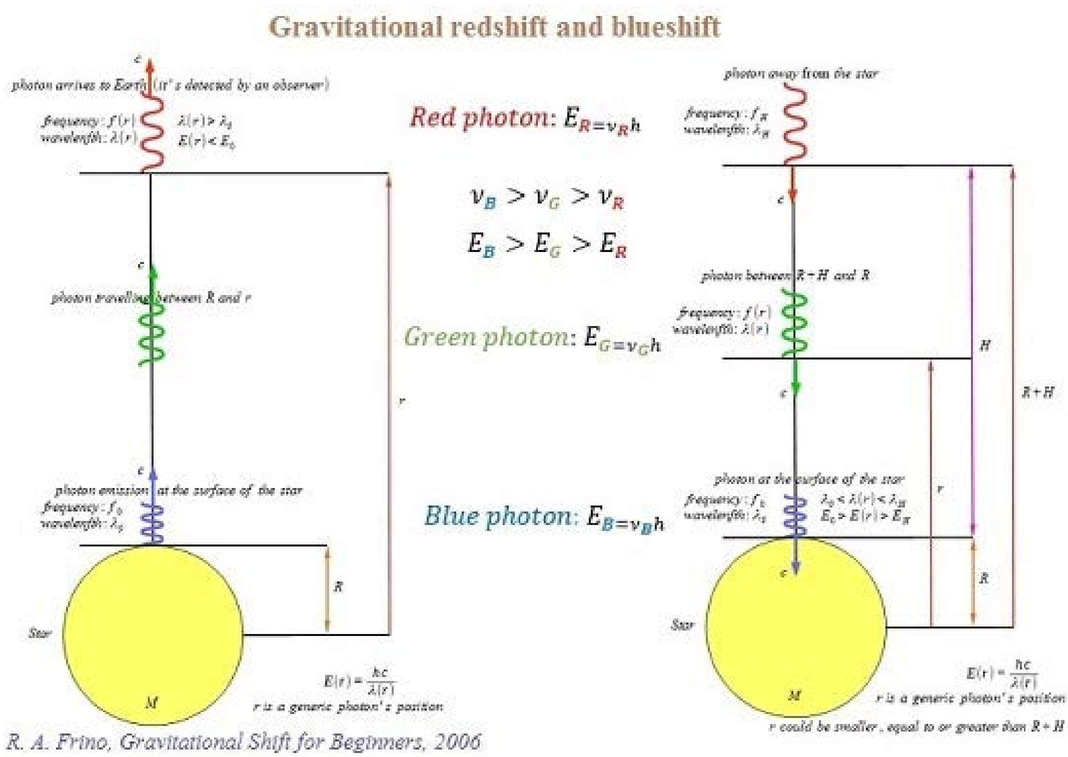

Fig 1: Left side, in gravitational redshift, a blue photon turns into a red photon as it escapes from a star. To the right side, a falling red photon in the gravitational field turns into a blue photon.

According to general relativity, it consumes energy when a photon is escaping from a gravitational field. But at the same time, it must always move at the speed of light, instead of in this experiment, the fall of a photon in a gravitational field is associated with an increase in frequency which is a gravitational blueshift. This is the common property between general relativity and quantum mechanics, and each of these two theories with its own approach, the behavior of photons in the gravitational field is explained. (Figure 1)

The only difference between the electromagnetic waves is in the energy of their photons. Low-energy photons, like radio photons, behave more like waves. While high-energy photons, like X-rays, behave more like particles. As mentioned before, the particle is the concentrated field. If we consider a photon as an excitation of an electromagnetic field, the blue photon is denser than the green photon and the green photon is denser than the red photon. Therefore, it can be said that in the gravitational redshift, the density of the photon energy decreases, and in the gravitational blueshift increases. As mentioned in the Particle and Field section, the photon energy density increases with the discrete amount. The least amount of photon discrete energy gain is called the sub quantum energy that is denoted by SQE. Therefore, it can be concluded that the energy of a photon is equal to the sum of the energy of its sub quantum energies. The greater the number of sub quantum energies of the photon, the higher the energy and frequency of the photon. The frequency of a photon is an intrinsic property that depends on its energy. The energy of a photon is equal to the sum of the energy of sub quantum energies within the photon structure. Therefore, the interaction of sub quantum energies within the photon structure is a frequency factor. If we assume the number of sub quantum energies in the photon structure is n, the photon frequency is proportional to n. Contrary to popular belief in quantum mechanics, photons not only have structures, in the same small space, there are many sub quantum energies that interact with each other, and like gas molecules in a capsule, the empty space between the sub quantum energies is significant and inside the photon behave like a fluid. The shape and center of mass of the photon energy are not fixed and change under the influence of the emission medium.

Sub Quantum Energy Principle

A sub quantum energy (SQE) is a part of photon energy that has properties of electromagnetic field, with constant mass m_{SQE} that moves with the constant amount speed $|V_{SQE}| > |c|$ relative to all inertial reference frame so that:

$$\nabla V_{SQE} = 0 \text{, in all inertial reference frames and any space} \qquad (6)$$

SQE principle (equation 6) shows that in every condition the mass, energy and the amount speed of *SQE* remains constant, and only the transmission speed V_{SQET} and energy E_{SQET} of *SQE* convert to its non-transmission speed V_{SQES} and energy E_{SQES} , and vice versa. So, we have;

$$|V_{SQE}| = |V_{SQET}| + |V_{SQES}| = constant \qquad (7)$$

$$|E_{SQE}| = |E_{SQET}| + |E_{SQES}| = constant \qquad (8)$$

Note: why is the speed of SQE faster than the speed of light? When we consider a photon to be point-like and unstructured, only its movement on one axis can be defined. But when a photon has a structure and components, the visualization and definition of the motion of its components is realized in three dimensions, and the path taken by SQE is not limited to one axis and in terms of quantity is the path traveled per unit time. That is, its speed is greater than the value it travels on an axis. So: $|V_{SQE}| > |c|$

Due to the structure of photons and the relations mass - energy equivalence, and the pair production and decay of particles and antiparticles, elementary particles are also composed of sub quantum energies. Just as a large part of the photon structure space is empty, so is the space inside the matter particles are also empty.

The conservation law of the amount of speed and modern physics

Equation (7) is the result of the sub quantum energy principle which indicates the amount of speed in different situations is always constant that we call the law of conservation of the amount of speed. Sub quantum energy in the structure of an atom, in space and quantum vacuum, the center of the stars, and even the center of the black holes, independent of physical conditions and interactions, obeys the conservation law of the amount of speed. The pair production and decay is an empirical example of the conservation laws of the amount of speed. (Figure 2)

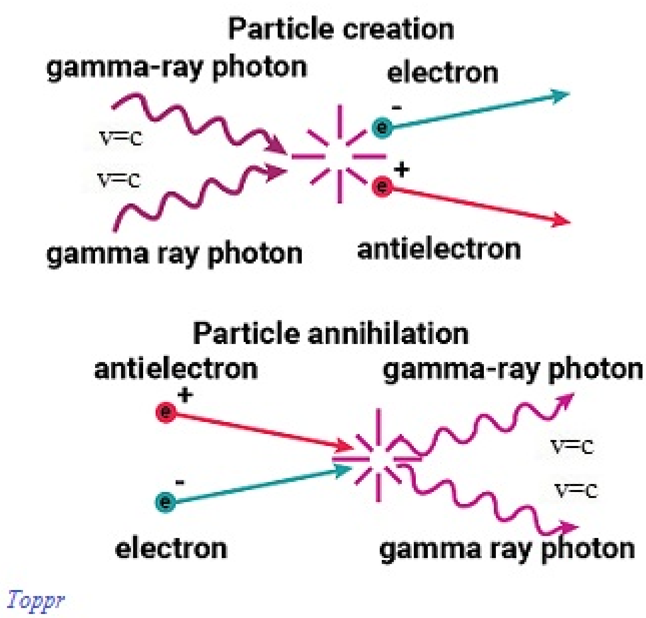

Fig 2: In the pair production and decay, the conservation law of the amount of speed is well seen.

At the top of Figure 2, two photons move at the speed of light and are converted into electron and positron pairs due to their collision, which moves at a speed less than the speed of light. At the bottom, the electron and positron decay into two photons that move at the speed of light. Matter and energy are two different forms of physical identity. The matter is energy-compact, so matter and energy has followed the conservation laws of the amount of speed under any conditions. If we add the laws of the amount of speed to the existing conservation laws, physics is getting deeper, simpler, and more real than ever. Newton's first law and the principles of special relativity can be deduced from it, and it is explainable why the speed of light is the same and equal c for all inertial observers. (Figure 3)

The fact is that the observer, the reference frame, the measuring instrument, and the incoming light are all made up of sub quantum energies that follow the conservation law of the amount of speed. Consider, for example, a spacecraft that travels at half the speed of light in space. In order for the spacecraft to reach that speed, it is accelerated by an external force. In this case, acceleration means changing the non-transmission speed to the transmission speed of the SQEs of the spacecraft and its occupants and its components, including the observer and the measuring instrument, which does not happen for the observer and the measuring instrument of the spacecraft launch site. The observer at the launch site measures the speed of light relative to the transmission speed of his SQEs, the observer in spacecraft also measures relative to transmission speeds of his SQEs, and both observers agree that the speed of light is constant and equal to c.

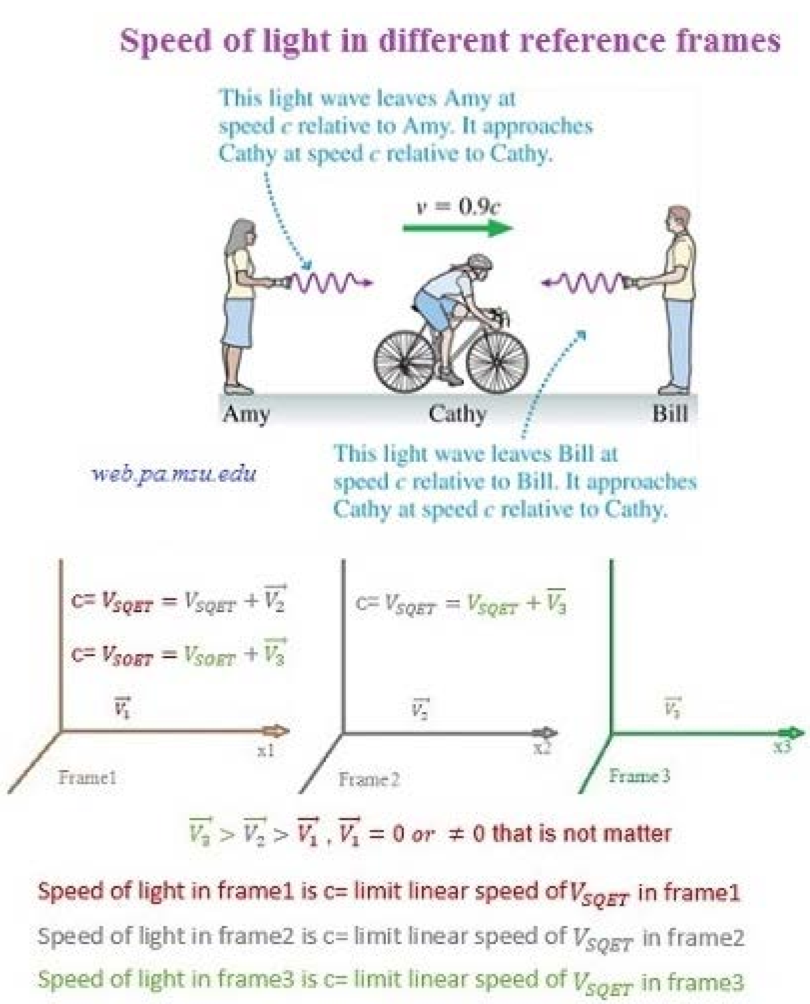

Fig 3: The conservation law of the amount of speed and special relativity

Is the speed of light in a gravitational field constant? To answer this question, we do an intellectual experiment. We throw a metal bullet upwards, the bullet rises to a point where it has kinetic energy. When its kinetic energy reaches zero, it stops and then falls toward the ground of the earth. A photon can also rise in a gravitational field as long as it has energy. This is why light cannot escape the gravitational field of a black hole because it loses all its energy when it is escaping. Using the conservation law of the amount of speed, we can answer many unanswered questions in physics. And explain phenomena that general relativity and Newton's universal gravitational law cannot explain, for example, inside black holes and gravitational singularity. The higher the gravitational field intensity of a cosmic object, the lower the altitude the light travels to lose all its energy, so that this height reaches zero. This means that if the intensity of the gravitational field is high enough, the speed of light at the surface of the object can be reduced to zero. This is the singularity of the Big Bang.

Sub quantum Divergence and Convergence

The founders of the Big Bang followed the expansion of the universe back in time and reached a very hot starting point. Now if we pay attention to the transmission and non-transmission speed instead of temperature, we will achieve better results. But before that, we need to define sub quantum energy continent divergence and convergence.

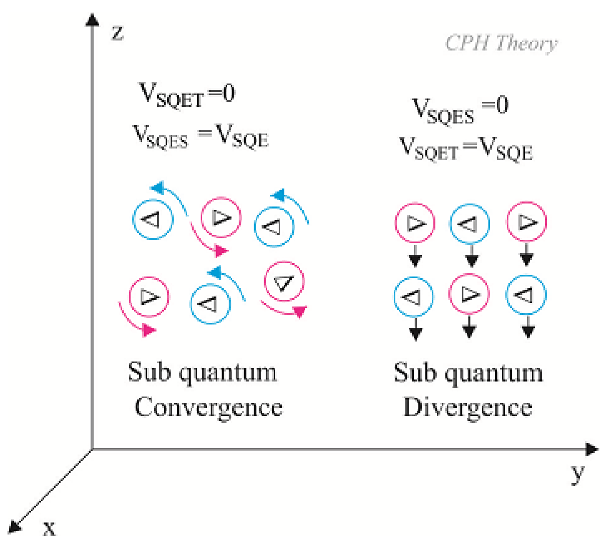

Fig 4: Sub quantum Divergence and Convergence

Sub quantum Divergence: if a particle/object falls in the gravitational toward a massive body, and the linear speed of its SQEs will be V_{SQET} , we say that the object has sub quantum divergence (figure 4). There is $V_{SQE} = V_{SQET}$ in the sub quantum divergence. So;

$$\text{Sub quantum Divergence;} \quad V_{SQET} \to V_{SQE} \Leftrightarrow V_{SQES} \to 0 \qquad (9)$$

Sub quantum Convergence: if total transmission speeds SQEs of a particle/object go to zero, $V_{SQET} \to 0$, we say that the object has sub quantum convergence (figure 4). There is $V_{SQES} \to V_{SQE}$ in the sub quantum convergence. So;

$$\text{Sub quantum Convergence:} V_{SQES} \to V_{SQE} \ \Leftrightarrow V_{SQET} \to 0 \qquad (10)$$

Suppose the world is shrinking. With today's knowledge and the definition of energy sub quantum energy and the conservation law of the amount of speed, suppose the observable universe collapses and condenses in gravitational singularity. As the universe gets smaller, the transmission speed of the sub quantum energies that have formed the particles is reduced and their non-transmission speeds are increased. Although it is not possible for the geometric shape of the SQE found similar in the macroscopic world, but a balloon full of gas can be considered, and assumed the material of the balloon is such that it can withstand any pressure and does not tear. Now press the balloon to make it smaller. The balloon shell is under pressure from gas molecules from the inside and is under pressure from the outside. When the universe collapses, the gravitational force is so strong which prevents the release of matter and energy and the distance between the SQEs is constantly decreasing. That is, matter tends toward sub quantum convergence. But according to the conservation law of the amount of speed,

SQEs are like spinning bullets and they can withstand external pressure to some extent that does not collide widely. The external force acting on any physical system is somewhat tolerable that the intrinsic properties of the system components are not violated. In this particular case, the collapsed universe has condensed in a very small volume, and as gravitational pressure increases, the distance between the SQEs decreases steadily

And gradually the SQEs undergo sub quantum convergence. A situation will come up that SQEs collide widely and like spinning bullets, they scatter around by colliding with each other. In other words, the force of gravity can be applied to some extent that converts the transmission speed of SQEs to non-transmission speed. That is, the maximum external force that here is the gravitational force is possible until all matter undergoes sub quantum convergence. The volume of singularity can reduction until the distance between the SQEs does not reach zero. In the central layers of singularity, SQEs constantly penetrate the higher layers. Finally, the pressure of the internal radiation overcomes the gravitational pressure and in a small fraction of a second, the singularity completely will be decomposed. Note that time exists for us as observers, there is no time for SQEs which always travel at a constant amount of speed and faster than the speed of light. Now let's see how this event can be explained by cosmological equations. Consider the Friedman equation (Equation 3), we review this differential equation using the definition of SQE and the conservation law of the amount of speed:

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right]R^2 = -kc^2$$

This equation is written for after the Big Bang that the universe is expanding, and is not defined for moment zero or earlier. But we assumed the universe had collapsed and condensed into a singularity. In singularity due to the high density and intensity of the gravitational field, no ray can emit from the surface of singularity. That is, the speed of light was zero before the Big Bang, and at the singularity level. We put zero instead of c and solve the equation.

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right]R^2 = 0 \qquad (11)$$

But $R \neq 0$, because assuming a radius of zero, we reach the same results as before, we were facing unanswered problems. So we will have:

$$R^2 \neq 0 \Rightarrow \left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho = 0 \Rightarrow \left(\frac{1}{R}\frac{dR}{dt}\right)^2 = \frac{8}{3}\pi G\rho$$

$$\frac{1}{R}\frac{dR}{dt} = \pm\sqrt{\frac{8}{3}\pi G\rho} \qquad (12)$$

A negative value is not acceptable, because the result is a volume contraction, while in singularity we considered the smallest possible volume.

$$\frac{dR}{R} = \sqrt{\frac{8}{3}\pi G\rho}\ dt$$

$$L_n R = \sqrt{\frac{8}{3}\pi G\rho}\ t + C\ , \qquad C\ is\ integer\ constant$$

$$R = e^{\sqrt{\frac{8}{3}\pi G\rho}\ t + C} = e^{C} e^{\sqrt{\frac{8}{3}\pi G\rho}\ t} \qquad (13)$$

For t=0, we have:

$$R = R_0 e^{\sqrt{\frac{8}{3}\pi G\rho}\ t} \qquad (14)$$

Because the universal gravitational constant is a constant value, it has no role in this discussion. The radius of the universe is given by an exponential function and depends on the initial radius and density of the universe, and in the Big Bang theory, infinite density is meant, which is not consistent with reality. After the explosion, the radius of the universe increases and its density decreases. But the density value is controlled by the speed limit. In fact, density is equal to the number of SQEs per unit volume that travel faster than light. The value of the transmission speeds of the SQEs after the Big Bang is obtained from the following equation:

$$c < V_{SQET} < V_{SQE} \qquad (15)$$

Although the density decreases after the explosion, in the first moments after the explosion it was so large that it could explain the cosmic inflation. Gradually, as the volume of the primordial universe increases, SQEs form electromagnetic waves and elementary particles. Their first production is cosmic background radiation that propagates in all directions. When the disintegration of singularity began, the dominance of gravity decreased and the particles interacted with each other. In addition, in this explosion, large masses of particles could be ejected from the singularity in the form of stars, black holes, and even galaxies. With the end of the cosmic inflation period, the universe emerged, and the speed limit became the speed of light, curbing the expansion rate of the universe, and Equation (5) lost its efficiency, and Equation (4), the basic form of the Friedman equation, was consistent to explain the universe. [18]

It should be noted, however, that the end of the period of cosmic inflation does not mean that the SQEs speed had not, or have not a role in the formation and future of the universe, SQEs are scattered throughout space and interact with each other. In addition, we saw in the gravitational blueshift that gravitational energy is converted into electromagnetic energy. Gravitons carry the gravitational force, and gravitons can interact with each other to convert electromagnetic energy.

Gravitational energy ripples through space. These two, sub-quantum energy and gravitational energy, produce quantum vacuum fluctuations.

Cyclic theory and CPH theory

Cyclic theory with different interpretations has entered physics for decades. Recently, a team of theorists used the mathematical power of string theory to solve the basic mysteries of the early universe and theoretically support repeating universe. [19]

Nobel Prize-winning physicist Roger Penrose has come up with an intriguing but controversial model for a cyclical universe called "conformal cyclic cosmology." All attempts to do so have remained highly speculative. Some of these speculations focus on supernatural forces. [12]

But in the Creative Particles of Higgs Theory (CPH Theory), the sub quantum energy was defined based on theoretical and experimental facts, the properties of the sub quantum energy were also obtained from laboratory observations and tested theories. The hidden layers of the microscopic world are fundamental, and quantum comes from the sub quantum, and space-time comes from the quantum. In fact, quantum mechanics is the boundary between sub quantum and relativity. Two points are most noteworthy here, first, special relativity is the experimental result of CPH theory, and second, our universe is cyclical and a small part of infinite existence. With this approach, cosmic microwave background is the product of the interaction of many universes, and we are within one of them. Our universe may not be repeated, but its components will be absorbed by the surrounding universes and will become part of another Big Bang component. The most important feature of CPH theory is that it does not reject any valid theories, including the Big Bang, but complements them and covers them in a specific way. In other words, CPH theory answers questions that are not justified by previous theories.

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