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Fundamental challenges of modern physics

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Abstract:

The translation of the lecture on the Telegram channel of Physics and Astronomy in Persian language, which was done on August 29, 2024. In this speech, two ideas, the first, Nima Arkani-Hamid's opinion that space-time is not fundamental, and the second, the experiment of the same behavior of particle and antiparticle in the gravitational field that has done in CERN was investigated and criticized.

We all know that nature and our thoughts are constantly changing. But changing the scientific paradigm is the most difficult stage in the development and progress of science. Thomas Kuhn, who popularized the term paradigm, describes a paradigm as follows: there are various stages in scientific growth: pre-paradigm stage, normal science stage, stage of anomalies and crisis, Modern physics is no exception to this rule.

Keywords: Gravitational dipole, CERN experiment, End of Space-time, Photon structure

Fundamental challenges of modern physics

Introduction:

Space-time and quantum vacuum are fundamental concepts of modern physics. The concepts of space and time are very familiar to humans and their existence is obviously. Their composition, that is, space-time, is known to physicists, measurable and undeniable. Although there are not few physicists who consider time to be illusory, the prominent physicist Nima Arkani Hamed considers space-time to be doomed and considers it to be the emergence of something more fundamental than space-time. On the other hand, the quantum vacuum is the origin of vacuum fluctuations and virtual particles. In the last two decades, one of the CERN physicists published articles stating that dark matter, dark energy and cosmic inflation can be explained by using quantum vacuum and gravitational virtual dipoles. And he convinced CERN management to organize an experiment to confirm or reject his hypothesis. The result of the experiment was disappointing. In this lecture, first, an attempt is made to explain what is more fundamental than space-time and how it becomes the cause of the emergence of space-time? In the second part, while examining the relationship between space-time and quantum vacuum, virtual particles and the theory of gravitational and electromagnetic dipoles are examined using the CPH theory. This review was conducted several months before the CERN experiment and its negative result was predicted and published in the form of an article. This view of space-time, quantum vacuum and particles were so real that it could predict the outcome of the CERN experiment.

Providing the infrastructure for the combination of space and time

At the end of the 19th century, the world of science in absolute Newtonian space was moving towards the shore of relaxing and certainty with the rhythm of the universal clock. Maxwell's equations occupied one of the last bastions of the physical mysteries, and light, as a small part of the spectrum of electromagnetic waves, moved at a constant speed c in a vacuum relative to the absolute frame of the ether. But for different inertial observers, the speed of light could be lower or higher than c, which could be calculated using Galilean transformations. Based on this, Maxwell thought of calculating the speed of movement of the solar system relative to the absolute reference frame of the ether. Maxwell's early death gave Michelson and Morley the chance to try this experiment, which was carried out in 1887, and the result was disappointing. Michelson admitted that the experiments on the relative motion of the earth and the ether had been completed, and the result was decidedly negative. From then on, the sound of the universal clock was not so soothing. Physicists wanted to know the reason for the negative result of the Michelson-Morley experiment. Any attempt to justify the cause of the negative result of this experiment failed. Finally, in 1893, Fitzgerald proposed a strange theory. According to FitzGerald, all bodies contract in the direction of their motion relative to the ether reference frame. Although this theory seemed strange and fake, because it was consistent with the hypothesis of the ether reference frame, it did not change Maxwell's electromagnetic equations, and it kept Galilean relativity in the same form as before, and it also justified the result of the experiment, was more acceptable. Based on this, Lorentz presented his transformations taking length contraction into account. Lorentz's transformations for the first time took time out of the absolute state and the universal clock went out. But what was preserved was the absolute reference frame of the ether and the illuminative property of the ether. In addition, it did not have a significant effect on the calculations at low speeds, it seemed acceptable (figure 1)

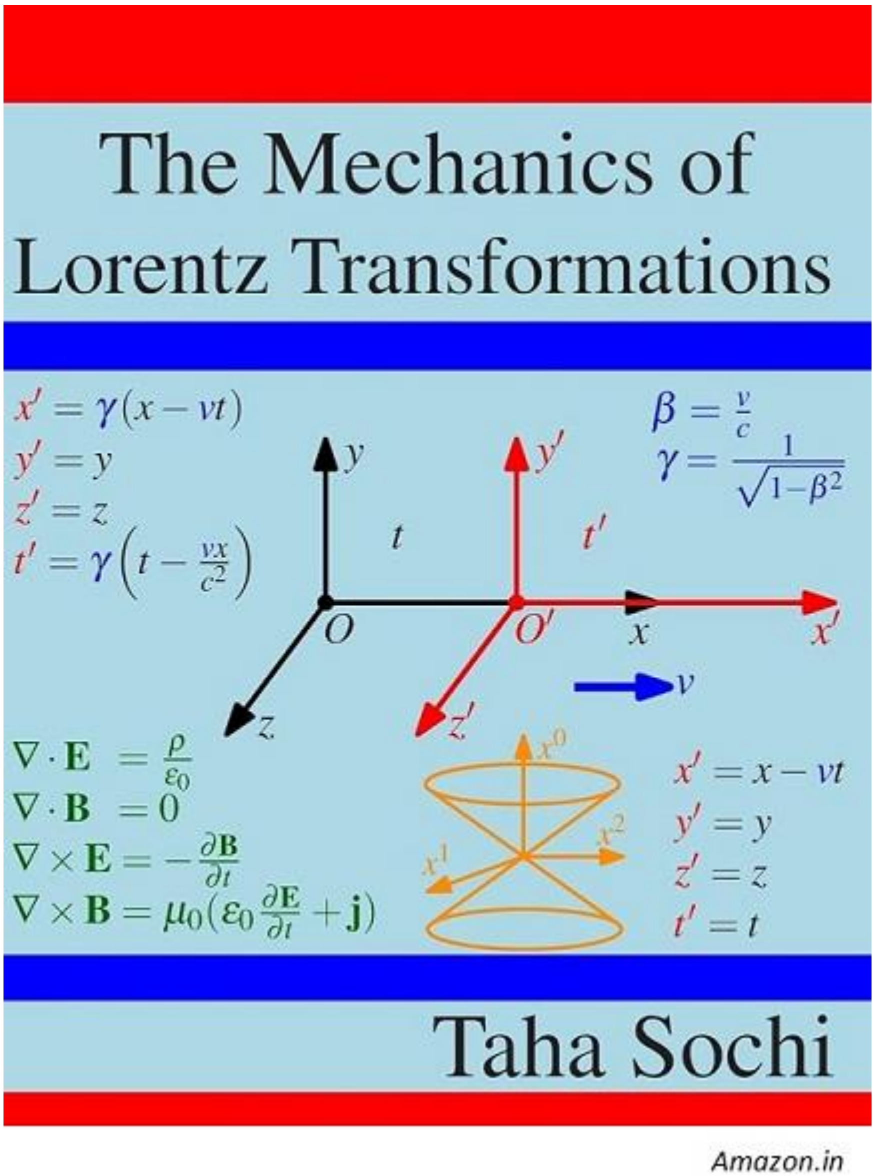


Fig1: Maxwell's equations and Lorentz transformations

Fundamental challenges of modern physics

Ultraviolet catastrophe and the importance of light in physics

In the 19th century, in addition to the Michelson-Morley experiment, some physical experiments such as the Brownian motion in 1827 and the photoelectric effect in 1887 were proposed, which could not be explained by classical physics. But none of them were as important as the ultraviolet disaster. Because in the Rayleigh-Jeans formula, the radiation intensity was inversely proportional to the fourth power of the radiation wavelength, in short wavelengths, it predicted very high values for the energy intensity, which was not compatible with the experiment, and it was called the Ultraviolet catastrophe. In 1900, to solve this problem, Planck combined the formulas of Wien and Rayleigh-Janes and presented a new formula to satisfactorily justify the spectral distribution of blackbody radiation and claimed that energy is absorbed and emitted in discrete units, which called quantum energy and presented the representative relation $E = h\nu$.

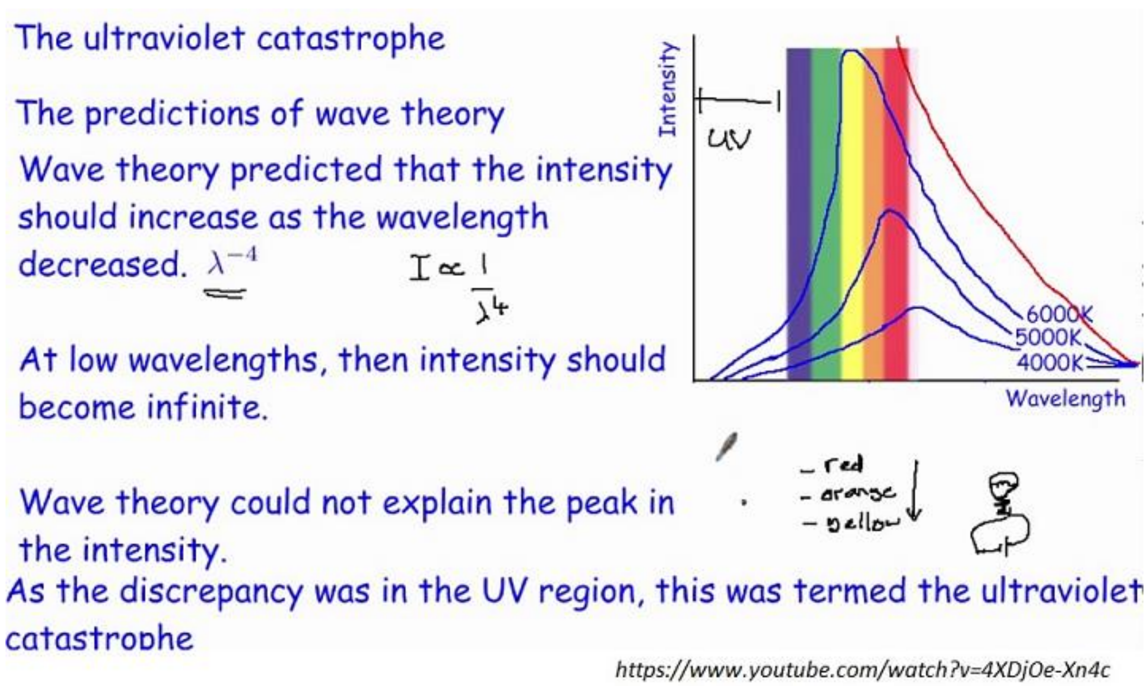
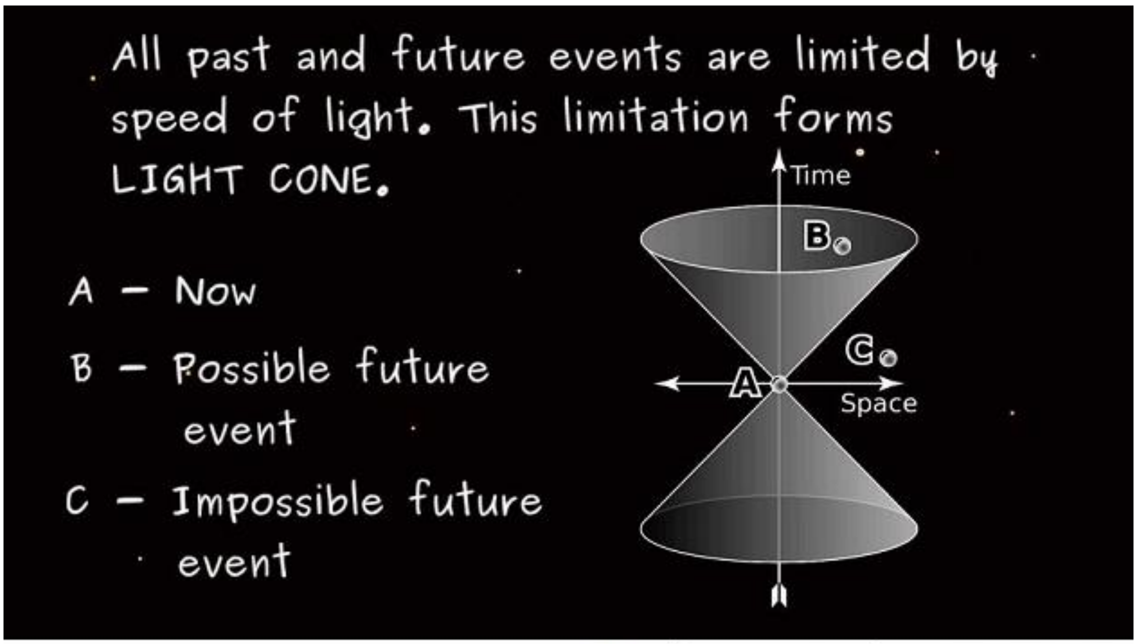


Fig3: Ultraviolet catastrophe

But the Ultraviolet catastrophe remained unsolved until in 1905, Einstein explained the photoelectric effect by using Planck's particle theory of radiation. Because some of the properties of light could be explained by the particle theory and others by the wave properties of light, Einstein's explanation of the photoelectric phenomenon seemed acceptable and did not face much opposition, and in 1921, Einstein received the Nobel Prize in Physics. Light has a special place in physical theories and equations. The wave-particle duality began with light, meaning that the boundary between real space-time and virtual space-time, where it separates visible space-time from hidden space-time, is the speed of light. In addition, in the standard model of fundamental particles, all particles, including electrons and quarks, are unique, while the number of photons is infinite, which is seen in the spectrum of electromagnetic waves. On the other hand, the photon represents one side of the mass-energy equivalence relation, and the other side contains all the matter in the universe. Therefore, knowing the photon is the first stage of knowing the visible universe and the hidden universe (figure 3).

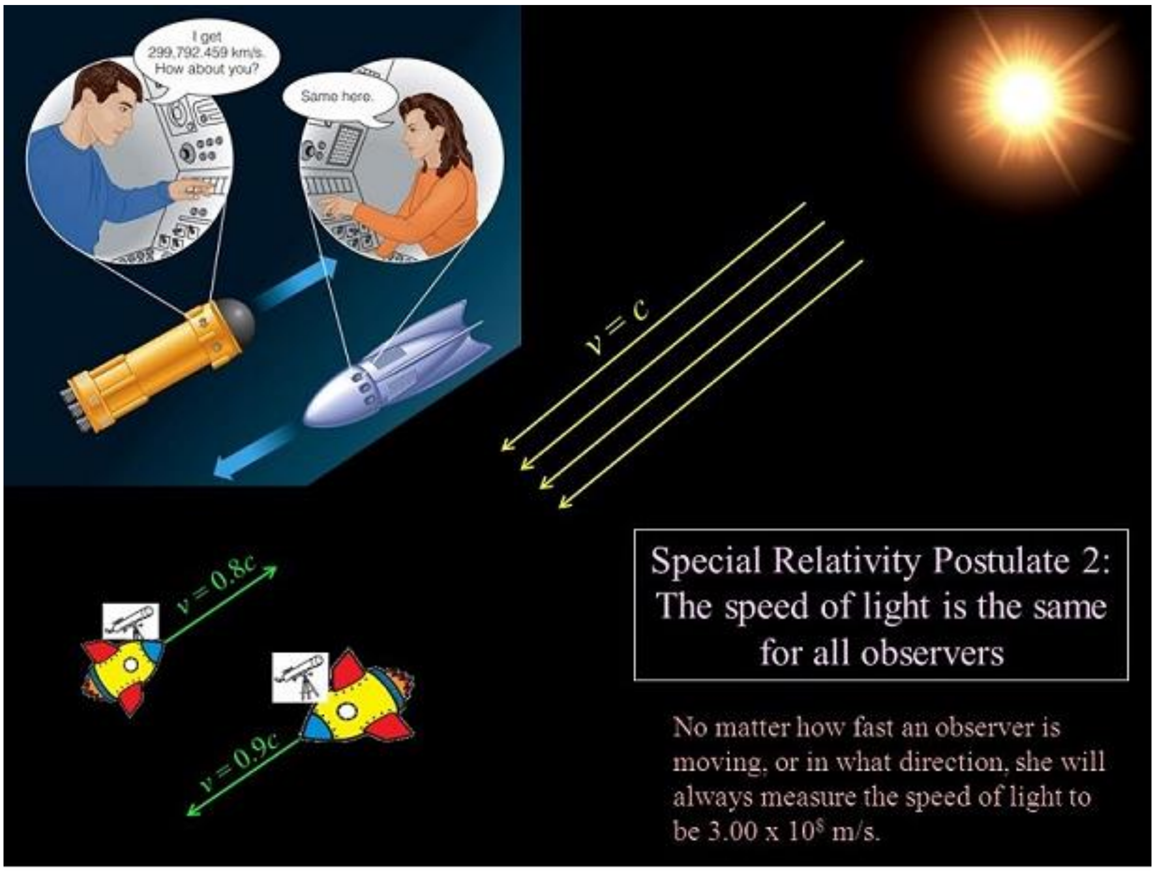


https://www.youtube.com/watch?v=hHJWnlvlTgw

Fig 4: Special relativity and space-time

Relativity and combination of space and time

In 1905, Einstein also proposed special relativity, and in its first principle, without mentioning the absolute reference frame of the ether, he stated that the laws of physics are the same for all inertial refence frames. Special relativity states that there is no absolute frame of reference and physical laws are independent of the frame of reference. This principle was the generalization of Galilean relativity. In Galilean relativity, the inertial observer cannot tell whether its frame is stationary or moving. According to the second principle of special relativity, the speed of light for all inertial observers in the vacuum is constant and equal to c. Therefore, each inertial reference frame has its own space and time, the length of rulers and rhythms of clocks can be converted from one inertial refence frame to another using Lorentz transformations. That is, space and time are inseparable from each other, and space-time is integrated into calculations. In this way, Einstein replaced the Galilean transformations with Lorentz transformations and showed that Maxwell's equations are not contradicted in Lorentz transformation and maintain their correct form. According to Lorentz transformations, nothing can travel faster than light. Only light and particles can move at the speed of light if their rest state mass is zero. In this way, the crisis caused by the Michelson-Morley experiment was resolved. In addition, the universal clock stopped working, absolute space disappeared, and the ether was removed as a frame of reference (figure 4)..



https://slideplayer.com/slide/9669866/

Fig 4: Observers and light speed

Conceptual problems and advantages of special relativity

In the figure 4, there are very important points that should be paid more attention to. Two spaceships are moving in two different directions to the light source. One of them approaches the source of light with a speed of eight tenths of the speed of light, and the second one moves away from the source of light with a speed of nine tenths of the speed of light. But the observers of both spaceships measure the speed of light equal to c. These measurements are empirically and theoretically correct, but inconsistent with common sense. For all its success, special relativity cannot conceptually answer the question of how the speed of light is constant for all inertial observers moving at a constant speed relative to each other. For example, suppose three reference frames are moving with constant but different velocities relative to each other. All three observers located in the frames are inertial observers and the speed of light in the vacuum is constant and equal to c for them. The question is, does light change its speed so that it is constant and equal to c for all three observers, or does all three observers change without to feel and their measuring instruments so that the speed of light is constant and equal to c?

All three frames of reference, observers and measuring instruments and light are all composed of the same physical nature, which manifest two different manifestations of matter and energy and must have common characteristics. That is, matter and energy must have common characteristics, and these common characteristics of matter and energy cause the speed of light in the vacuum to be constant and equal to c for all inertial observers. These common characteristics of matter and energy have not been noticed by physicists and were investigated and proposed for the first time in the CPH theory. Einstein also noticed some problems and wanted to know the physical nature of the photon. In 1951, he said: All these fifty years of thinking do not bring me closer to the answer to this question, what are the quanta of light? Even Einstein's explanation of the photoelectric phenomenon did not explain how transverse electromagnetic waves travel in vacuum without a material medium. Therefore, knowing light quanta or photon can be effective in solving physics problems. Special relativity changed some fundamental concepts of physics, including time and frame of reference, and in addition introduced new concepts to physics. Fundamental concepts usually become paradigms, and changing paradigms is not so easy, and proponents of ether theory refused to accept special relativity for several decades. Special relativity provided a new conceptual system. The concepts of special relativity were coordinated and purposeful with each other and helped the development of physics, which gradually became clear to physicists and accepted. Mass-energy equivalence showed that mass and energy are two manifestations of the same physical nature.

The birth of modern physics

Einstein used Riemannian non-Euclidean geometry and considered gravity as a geometric property of space-time in order to generalize space-time from inertial reference frames to accelerated reference frames. In general relativity, around any mass (or energy), space-time is curved, and clocks run slower in a stronger gravitational field. Like special relativity, general relativity introduced new concepts such as gravitational red and blue shift and gravitational lensing into physics. In 1919, the curvature of space-time around the Sun was confirmed and Einstein became world famous. In 1920, in a lecture entitled "Ether and Relativity" that he gave at the University of Leiden, he explained the importance of the existence of ether for a better understanding of the structure of space-time. He said: "According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense". [1]

Fundamental challenges of modern physics

Advances in quantum mechanics in the 1920s motivated physicists to combine special relativity with quantum mechanics. Although the combination of special relativity with quantum mechanics was not easy, it was finally done and relativistic quantum mechanics was born. The equivalence relation of mass-energy was developed by Dirac and the new and unexpected concept of antiparticle entered physics. Quantum mechanics, like relativity, introduced new concepts, including the uncertainty principle, into physics that were unimaginable before the 20th century. One of the results of the uncertainty principle is the concept of quantum vacuum and fluctuations of vacuum and virtual particles. Virtual particles-antiparticle are created as particles pairs and disappear after a very short time. The greater the time uncertainty, the lower the energy uncertainty. This means that the higher energy of a virtual particle causes the particle-antiparticle pair to annihilate faster. In addition, from the perspective of new quantum mechanics, fundamental forces, other than gravity, are exchanged between fermions by virtual particles called bosons. In this way, a new chapter in physics began under the title of modern physics (figure 5).

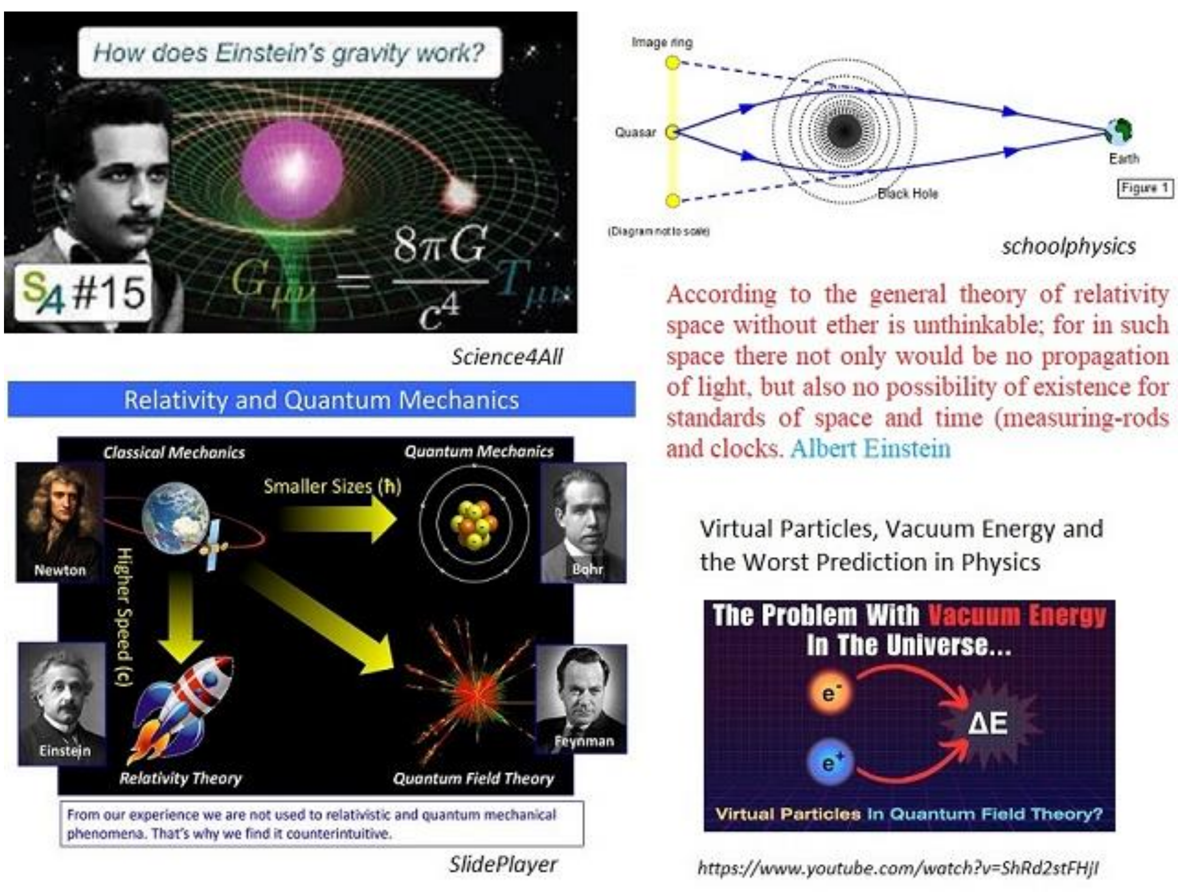


Fig5: Establishment of relativistic quantum mechanics

Fundamental challenges of modern physics

Modern physics and mysteries of cosmology

In the past century, laboratory equipment and space telescopes have made amazing progress that has revolutionized human understanding of the physical and cosmological laws. Although these developments, including the Big Bang theory, solved many problems, they raised new problems and mysteries, including cosmic inflation, dark matter, and dark energy, which are not so easy to solve. The results of the combination of quantum mechanics and special relativity have caused the solutions that are presented to solve new problems to be influenced by relativistic quantum mechanics. Do quantum vacuum and virtual particles also belong to space-time? Special and general relativity are observational theories and cannot explain virtual phenomena. In general relativity, according to the equivalence principle, the laws of physics are the same in a reference frame with uniform acceleration, with a uniform gravitational field. One of the problems of modern physics is that unlike special relativity, general relativity is not compatible with quantum mechanics and these two theories cannot be combined. But time is a common concept in all three theories of quantum mechanics, special relativity and general relativity. In addition, human is sensitive to the nature of time. For this reason, time and creation have a special place in myths, philosophy and religions (figure 6).

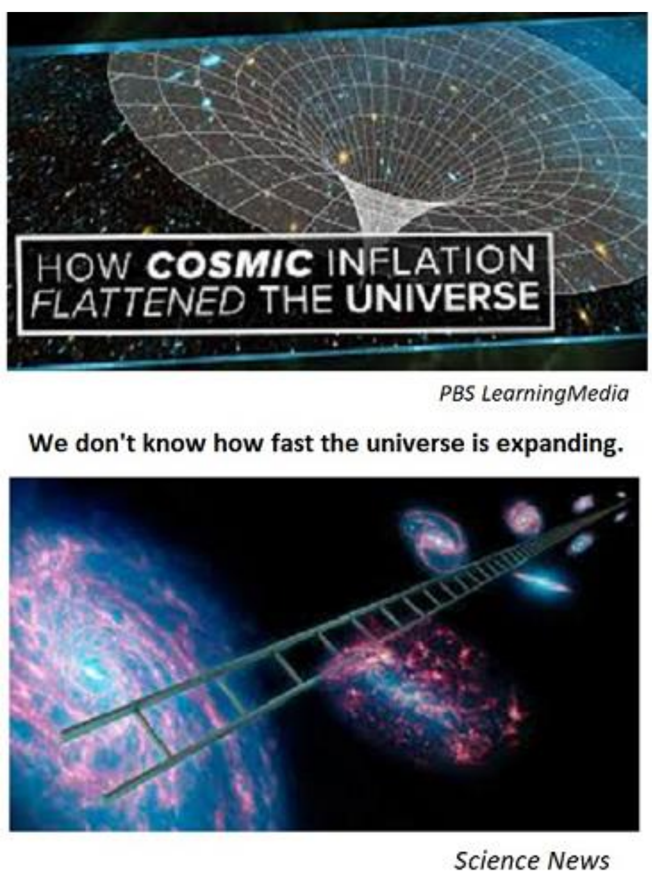


Fig 6: Quantum mechanics is not compatible with general relativity

Fundamental challenges of modern physics

What is the reality of time?

Ever since relativity was introduced, the concept of time has been surprising to those who heard the news that the of time was slowing down. But physicists and philosophers thought about the reality of time more than others.

The list of philosophers and physicists who have thought and commented on the concept of time is very long, among them Lee Smolin, John Wheeler and Julian Barbour are the most famous. But Nima Arkani Hamed's opinion is simpler, more accurate and closer to physical realities than the others. Nima Arkani Hamed, in addition to the detailed and in-depth studies he has in theoretical physics, also has an admirable command in laboratory physics in using laboratory tools and analyzing the results of experiments. For this reason, he was invited to lead China's large accelerator project, which is larger than the CERN laboratory. Nima Arkani Hamed is one of the prominent phenomenologists of particle physics who deals with the relationship between theory and experiment. His research has shown how the extreme weakness of gravity, relative to other forces of nature, may be explained by the extra dimensions of space, and how the structure of relatively low-energy physics is constrained within the framework of string theory. He has been at the forefront of developing new physical theories that can be tested at CERN's Large Hadron Collider (figure 7).

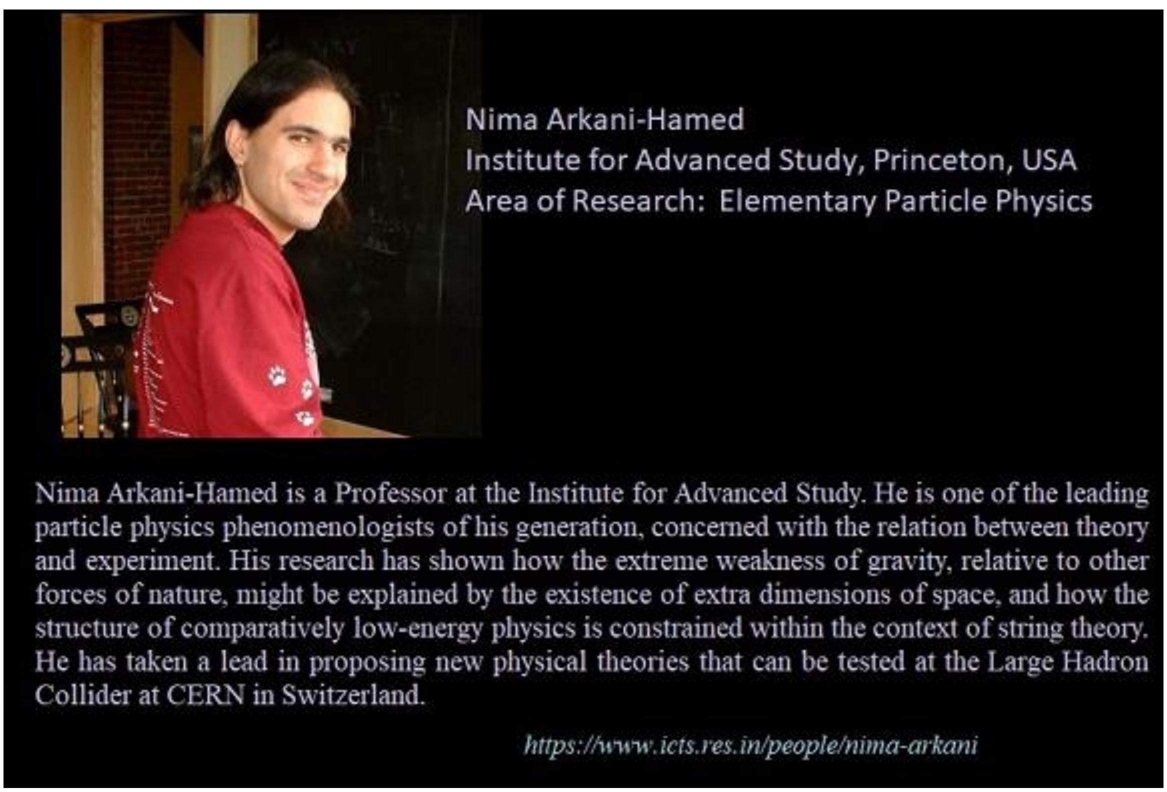


Fig 7: Nima Arkani Hamed

Fundamental challenges of modern physics

Space-time is doomed

Nima Arkani Hamed says that space-time is not fundamental and is doomed. There is something more fundamental than space-time, space-time does not really exist and has emerged from more fundamental components. All space-time problems are related to the simultaneous existence of quantum mechanics and gravity. If you want to probe a small and smaller region in space as well as in time, you need high and higher energy... just like we do at CERN. High and higher energies are found for short and shorter distances due to gravity, a new phenomenon. Whether you like it or not, in this way, you put a large amount of energy in a very small area of space, and eventually that small area turns into a black hole from which even light cannot escape, and this phenomenon coincides with the time you want. Do you know how space-time passes in that small area? If you take into account what we know about gravity, you can predict when this problem will occur at a distance of the Planck length of ten to the power of minus 35 meters. The problem is that we don't know what happens to space-time in small distances, and space-time should be thrown away. Arkani Hamed presented his opinion in several lectures, including a 2010 lecture via messaging entitled Space-Time Is Doomed, What Will Replace It? And in 2012, he published a video titled "The End of Space-Time" on YouTube (figure 8).

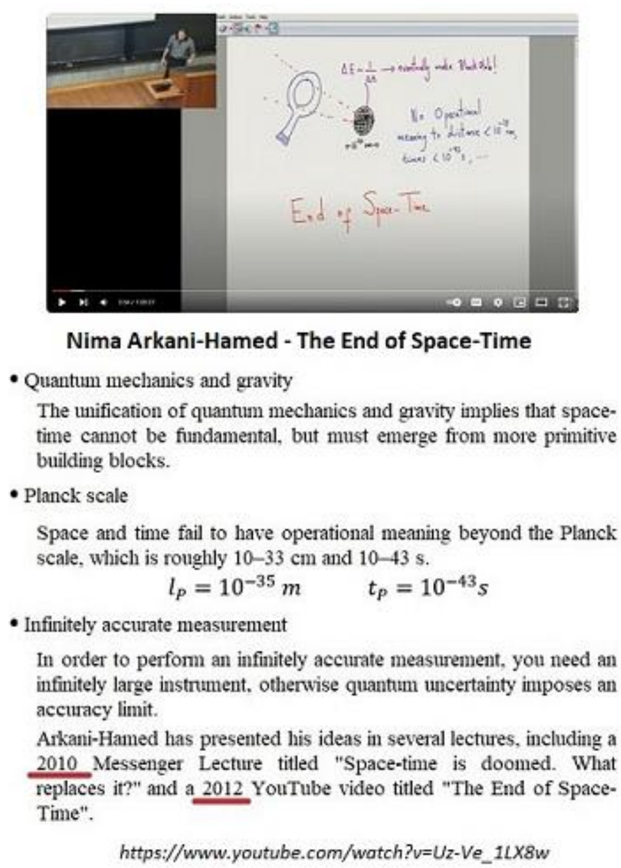


Fig 8: Space-time is not fundamental

Fundamental challenges of modern physics

What elements are more fundamental than space-time?

According to Arkani Hamed space-time is the emergence of more fundamental components, this question arises, what are the more fundamental elements that space-time also appears in the emerging phenomena? Space cannot be ignored, because when there is energy, even at the Planck length scale, there is definitely space. So, we have to see under what conditions there is no time? To find the answer to this question, I propose a thought experiment. Such an experiment is not possible in reality. But humans have this characteristic that they can have unrealistic imaginations and thoughts. Suppose there is no acceleration in nature? Or suppose that acceleration disappears in nature, that is, there is not any accelerated movement in universe. what happens? The rotation of the earth around the sun is an accelerated motion, as the acceleration disappears from the earth's motion, the earth goes out of orbit. The solar system falls apart. Electrons leave the structure of atoms. That is, without acceleration, the universe never was appeared (figure 9).

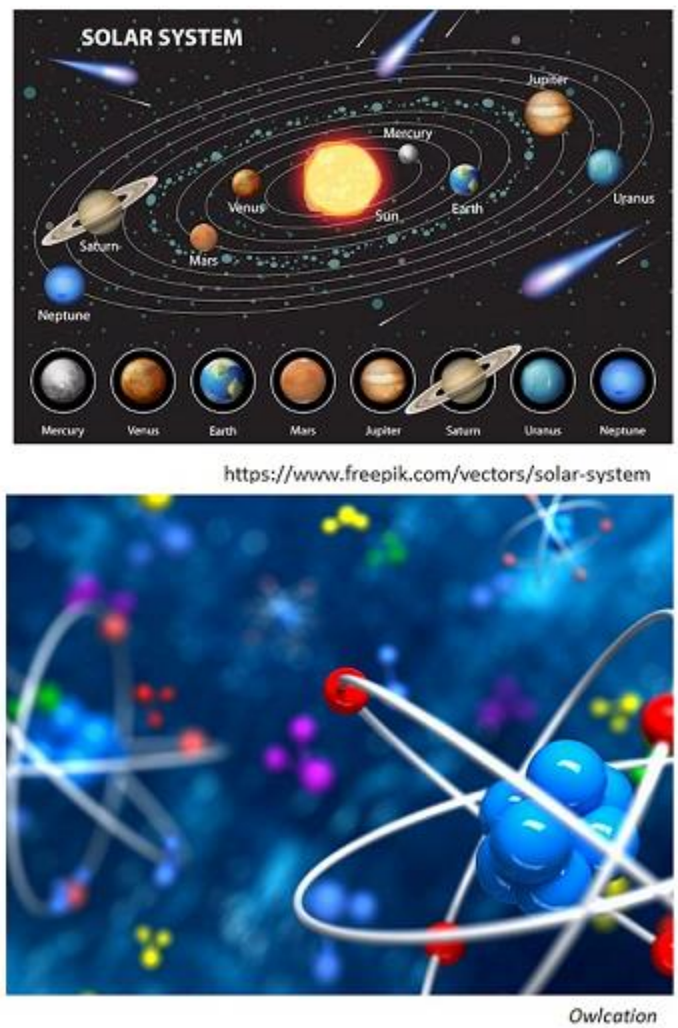


Fig 9: The role of acceleration in physical emergence

Fundamental challenges of modern physics

So, acceleration is a fundamental quantity to the formation of the universe which has not been sufficiently worked on. With the advent of modern physics, many concepts of classical mechanics were revised, including speed limit, mass, force, and time, but the concept of acceleration was not revised. For the first time, acceleration entered physics mathematically with Newton's second law. Newton's view was on extrinsic acceleration, that is, when an external force is applied to an object, regardless of what happens in the structure of the object, its apparent acceleration is examined and calculated. This attitude to acceleration entered modern physics from classical mechanics. While if we want to define acceleration within a structure, first, we must see what particles and objects are made of, and when the it accelerates, what happens to its elements and why is its speed limited? With the intrastructural approach, the reason for the emergence of the laws of physics can be understood and explained. Then it is very simple and reasonable to show why space-time is not fundamental.

My problem with physics was the concept of acceleration

My problem was the physical understanding of the concept of acceleration and it started in 1962 when I was at first grade of high school. I thought about it almost constantly. After I entered the university, I thought more scientifically about the concept of acceleration. In 1987, I came to the conclusion that if I know and explain the structure of the photon, I can know and explain the structure of other elementary particles according to the mass-energy equivalence. I did this and called the elements of the photon "particles of existence" and defined the structure of the photon and other subatomic particles in a very basic way. I realized that the particles of existence do not experience the passage of time. I concluded that time is zero for the particles of existence, and in 1992, I published in Persian the book Scientific theories - rejection or generalization? The important result I got was a new definition of acceleration. Next, I explained the properties of the particles of existence, which were later called CPH. When the CPH takes the spin, it is called a graviton. For now, it seems enough to say that CPHs do not have thermodynamic properties and their entropy is zero, their energy and the amount of speed are always constant, they do not gain or lose energy. Because entropy is considered as the arrow of time, CPHs with zero entropy do not experience the passage of time. That is, time is not fundamental, and as a result, as Nima Arkani Hamed says, space-time is not fundamental. On the other hand, the constituents of photons, fermions and bosons carrying fundamental interactions are made of CPHs, even the fundamental particles of the standard model of emergence and their constituents are CPHs. As a result, as Arkani Hamed says, space-time is emergence. In fact, time does not exist physically, the clocks are existing. Each atom is a clock, similarly molecules are clocks and everything made of molecules is a clock. Humans, trees, earth, stars, galaxies and even the universe is a clock that was formed approximately 14 billion years ago according to the Big Bang theory. All clocks have entropy and have an arrow of time, and the direction of this arrow is from the past to the future. This explanation should not surprise us, before the introduction of relativity, even humans knew that they would eventually break down into their constituent parts.

نظریه های علمی - رد یا تعمیم؟

شناسنامه کتاب

نام کتاب ـ نظریه‌های علمی ـ رد یا تعمیم ؟

نویسنده : حسین جوادی

ناشر ـ انتشارات اتا

سال نشر ـ ۱۳۷۱ Year 1992 AD

تصویر روی جلد

"مسیر الکترونها وپوزیترونها در اطاقک ابر، فرمول سمت چپ رابطه جرم انرژی، فرمول سمت راست در فصل نهم تشریح شده است."

نظریه ناوردایی ۱۸۷

هر فوتون را می‌توان توده‌ای از ذرات بنیادی در نظر گرفت، و این ذرات را می‌توان ذرات بنیادی تشکیل دهنده جهان به حساب آورد، و نامی خاص نظیر «ذرات هستی» به آن داد، که تحت شرایط مختلف فیزیکی، پیوستگی های مختلفی نظیر، الکترون، پوزیترون، پروتون، نوترون و... را بوجود می‌آورند.

نظریه ناوردایی ۱۹۵

بنابراین زمان برای «ذرات هستی» که همواره با مقدار سرعت حد در حرکت هستند، صفر است، بعبارت دیگر هیچ لحظه‌ای از عمر «ذرات هستی» نمی گذرد

بعداً نظریه ناوردایی به نظریه سی پی اچ تغییر نام داد و ذرات هستی سی پی اچ نامیده شدند.

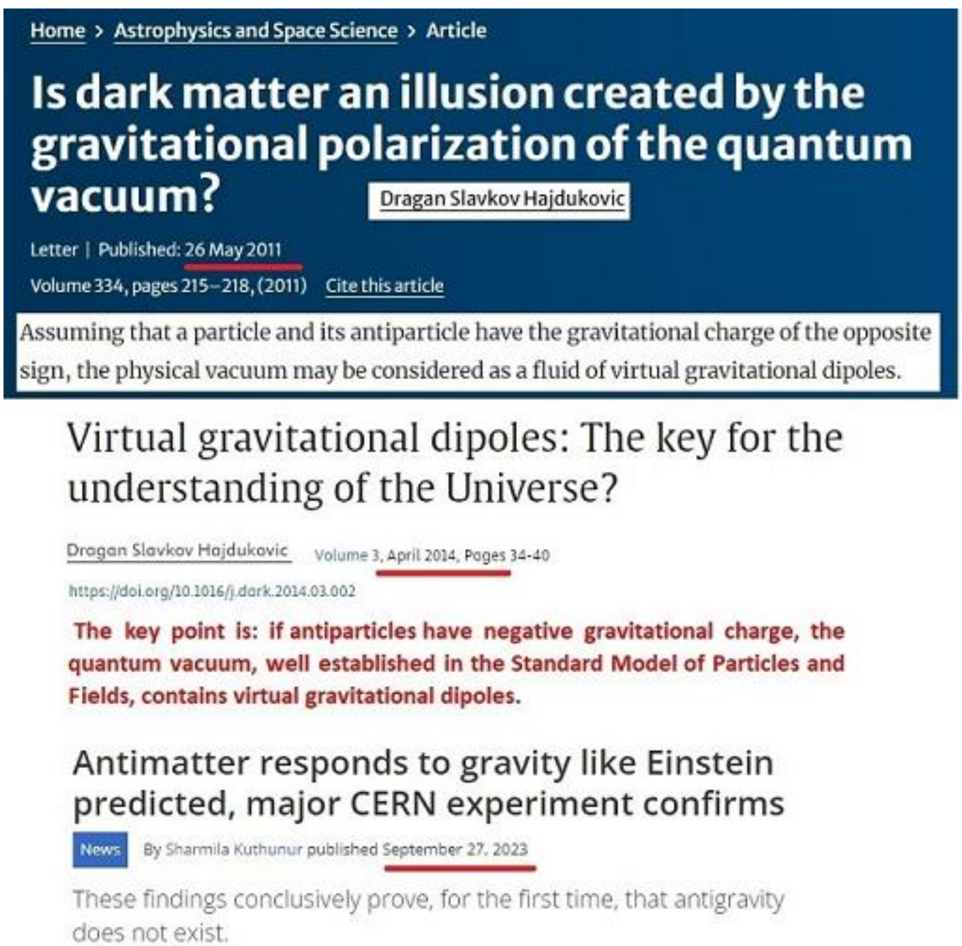
Creative Particles of Higgs Theory or CPH Theory

Fig 10: In 1992, the CPH theory showed that space-time is not fundamental

From clock to gravitational dipole

Most philosophers agree that time is not a universal force. It's not like gravity or electricity - you can't measure time the way you measure speed and distance. Time does not exist independently; Instead, it's more like a tool we use to make sense of the world around us. Other philosophers see time as an essential part of the human experience, something that shapes our memories and connects us. Consider this question: How do we organize ourselves as a society without a shared understanding of the meaning of time, such as day or year? How do we know when to start school or work? Therefore, time is both a personal feeling and understanding, and a collective knowledge. What we need to know from a scientific point of view is what are the physical characteristics of clock components and how were the first clocks made? Is there a relationship between the emergence of time or the formation of the clock and the quantum vacuum? [2] I do not say this without reason. In modern physics, there is no precise definition of virtual particles. In addition, it is not explained how the ups and downs of vacuum occur? What are the physical properties of virtual particles? The fact that virtual particles and quantum vacuum remain unknown causes unrealistic predictions and expectations of quantum vacuum. For example, CERN physicist Dragan Hajduković tried for years to explain dark matter, dark energy, and cosmic inflation using the quantum vacuum and virtual gravitational dipoles. He has published many articles in this field. He believed that virtual gravitational dipoles are the key to understanding the universe. According to Dragan, a particle and its antiparticle have opposite-sign gravitational charges, and he considered the quantum vacuum as a fluid of virtual gravitational dipoles. According to Dragan, the gravitational force between particles and antiparticles is repulsive. He emphasized in his articles that if it is experimentally confirmed that antimatter is ascending, major changes will occur in astrophysics and cosmology. [3]

The key point is this: if the antiparticles have a negative gravitational charge, the quantum vacuum contains virtual gravitational dipoles. I got to know Dragan's ideas in early 2023 and the first article I read by him was published in 2011(figure 11).


Home > Astrophysics and Space Science > Article

Is dark matter an illusion created by the gravitational polarization of the quantum vacuum?

Dragan Slavkov Hajdukovic

Letter | Published: 26 May 2011

Volume 334, pages 215–218, (2011) Cite this article

Assuming that a particle and its antiparticle have the gravitational charge of the opposite sign, the physical vacuum may be considered as a fluid of virtual gravitational dipoles.

Virtual gravitational dipoles: The key for the understanding of the Universe?

Dragan Slavkov Hajdukovic Volume 3, April 2014, Pages 34-40

https://doi.org/10.1016/j.dark.2014.03.002

The key point is: if antiparticles have negative gravitational charge, the quantum vacuum, well established in the Standard Model of Particles and Fields, contains virtual gravitational dipoles.

Antimatter responds to gravity like Einstein predicted, major CERN experiment confirms

News By Sharmila Kuthunur published September 27, 2023

These findings conclusively prove, for the first time, that antigravity does not exist.

Fig 11: Particle and antiparticle behave the same in the gravitational field

Fundamental challenges of modern physics

CERN experiment and behavior of antimatter in gravitational field

In June 2023, I published a paper titled "A conceptual model of how the physical universe works". In the abstract of this article, I wrote: “Many theories have been proposed to solve the dark matter problem. In one of them, gravitational charge and gravitational dipole are emphasized, which is discussed in this article and is close to CPH theory. According to CERN physicist Dr. Dragan Hajdukovic, the force of gravity between particles and antiparticles is repulsive, and he considers quantum vacuum fluctuations to be virtual gravitational dipoles. If we leave aside the repulsive force between particles and antiparticles, with the properties of positive and negative color charge of particles and antiparticles proposed in CPH theory, we can conclude the gravitational dipole from experimental observations and make its theoretical base strong and justified. Gravitational and electromagnetic dipoles exist in the quantum vacuum and in the photon structure. This approach is based on experimental observations of recent decades and provides conceptual model of how the universe works, of which dark matter is a part”. [4] In other words, I explicitly wrote and published those particles, and antiparticles, as well as virtual particles and virtual antiparticles, behave the same in a gravitational field. Approximately four months after the publication of my article, on September 27, 2023, an experiment was conducted at CERN for the behavior of the antiparticle in the gravitational field, and it showed that the particle and antiparticle behave the same in the gravitational field, and Dragan's opinion is not correct. In addition, this experiment showed that antigravity does not exist. [5]

Mathematics and physical concepts

In my opinion, mathematics has dominated the physical worldview so much that physical concepts have lost their place. Dragan assumed that the gravitational force of particle and antiparticle is repulsive and with this assumption he defined virtual gravitational dipole. The community of physicists had no reason to reject it either, and they checked his opinion with experiments. While I tried to recognize and explain virtual particles from the ground up. What I did was, after defining CPH, I proposed the conservation law of the amount of speed. In the theory of CPH, CPH is a particle with constant energy and constant amount of speed that moves with constant amount speed relative to all inertial reference frames and in all physical conditions. In the direct interaction of CPHs with each other, some of their linear speed becomes non-linear speed. This is the beginning of the emergence of acceleration. Using this definition, which I called the CPH principle, I revised the Dirac equation and sea in the gravitational field. [6] When the photon falls in the gravitational field, the gravitational energy is converted into electromagnetic energy. Using the photon's electromagnetic properties, I defined positive and negative color-charges, and magnetism - colors to explain the photon's electromagnetic properties. In the next step, I defined positive and negative subquantum energy, and positive and negative virtual photons (figure 12). Virtual particles are the first clocks that form in nature and experience the passage of time, lose energy and decay into CPHs, or gain energy and their energy increases. These results were not achieved in a day, I studied and thought for years to reach such results. One of the surprising results of this approach is the law of conservation of the amount of speed, which includes subquantum energies in addition to CPHs.

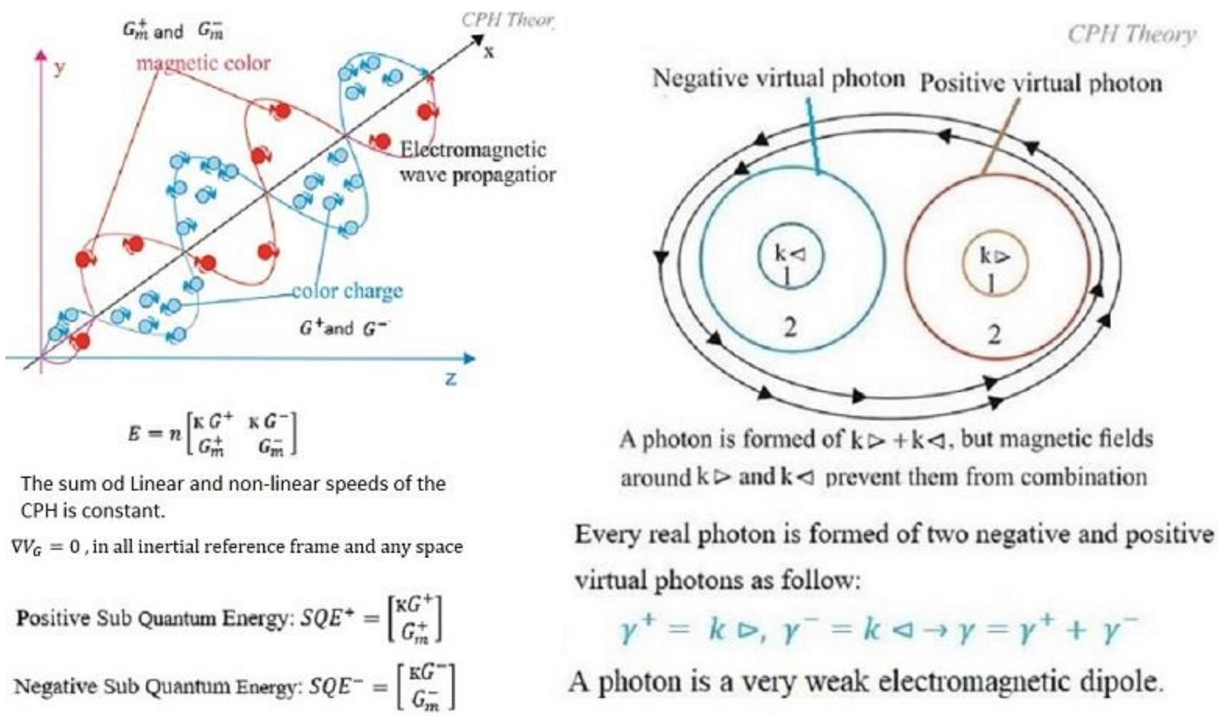


Fig 12: Structure of photon

That is, the amount speed of subquantum energy and virtual photons is always constant for all inertial observers, because they are composed of CPHs. A real photon consists of a pair of positive and negative virtual photons with equal energy and different electric charge. Therefore, the photon is a very weak electromagnetic dipole. According to pair production and decay of the particle-antiparticle, everything comes from sub-quantum energy and finally from CPH. CPH does not have thermodynamic properties, because, its energy and the amount of speed are constant, so, CPH does not experience the passage of time. That is, time does not exist at the lowest level of existence. In addition, subquantum energies and virtual photons necessarily behave the same in the gravitational field. Because all of them are made up of color-charges and the magnetic-colors and they are made of electromagnetic energy and behave like photons in the gravitational field.

The interesting and noteworthy point is that, in addition to time, electromagnetic energy and light have also emerged, that is, the entire manifest universe, even space-time has emerged.

The birthplace of fundamental interactions

In modern physics, around fundamental particles, including charged particles, it is assumed that there is the electric and gravitational field. But it is not clear how the fundamental particles produce these fields. In modern physics, there is no explanation as to why two positively charged particles repel each other in long distances (relative to the radius of the atom' nucleus) but attract each other in short distances. Using the structure of fundamental particles, we can define the birthplace of the fundamental forces and explain the reason for the production of strong and weak nuclear forces, the reason for the spontaneously broken symmetry and the emergence of the four fundamental forces. [7]

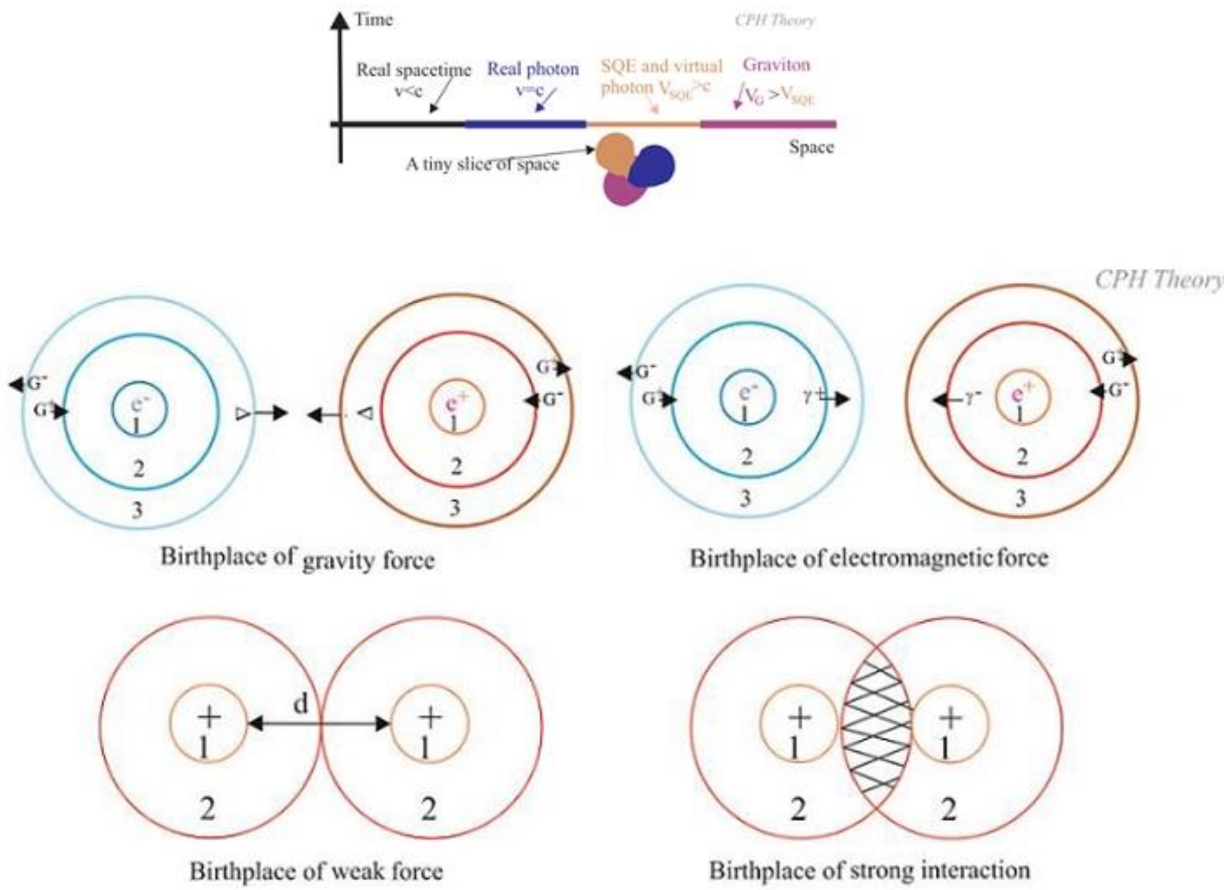


Fig 13: Birthplace of fundamental interactions

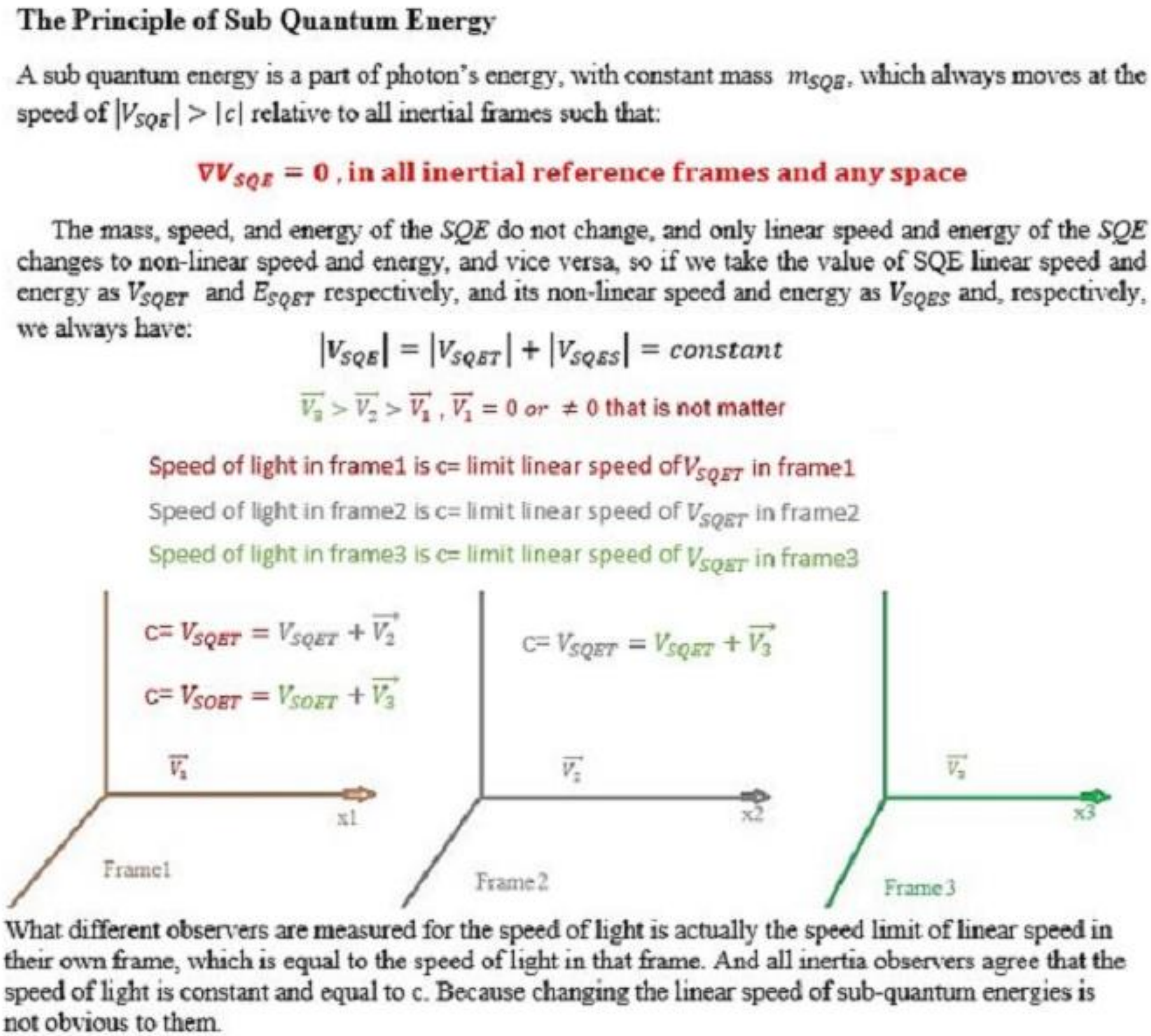
In my articles and books, I have explained in detail the mechanism of generating fundamental interactions. Here I will summarize it. The standard model of fundamental particles does not have a precise definition of fundamental particles, and various definitions have been provided for them, including the collapsed wave function and quantum field excitation. Among these interpretations, the particle as field excitation seems more realistic. The first and most fundamental field is the CPH field, which has filled the entire universe. The space between stars, inside stars and planets, even inside molecules and atoms is full of CPHs, which creates the quantum vacuum from the interaction of CPHs with each other. Also, subatomic particles interact with CPHs. In the interaction of subatomic particles with CPHs, subquantum positive and negative energies and virtual photons are produced. There is no time in the CPH field, which is called non-obvious space. From the interaction of CPHs with each other, electromagnetic fields and virtual particles are created, and clocks are formed and time begins, which is called virtual space-time. Virtual particles move faster than light and behave tachyonally. As they lose speed, their energy increases and as they slow down, their energy increases. [8]

These properties of tachyons are direct results of special relativity, which is explained in CPH theory. When virtual particles or tachyons slow down to the speed of light, they become real photons and manifest space-time is formed. Fermions are formed in manifest space-time. From the interaction of fermions with CPH space, bosons carrying fundamental forces are produced, which are not detectable, because they are in virtual space-time. The higher the density of CPH around the charged particles and the closer it is to the center mass of the particles, the greater the strength of the interaction produced. For this reason, particles can produce more than one interaction with different interaction strength. For example, quarks can simultaneously produce all four fundamental interactions. [7] Any small slice of space can include all three non-manifest spaces, virtual space-time and manifest space-time. Three small slices of space, and the birthplace of fundamental interactions are shown in (figure 13).

Man, and the laws of physics

Our physical observations and experiences are limited to the apparent universe or real space-time, because man and his observation and measurement tools belong to real space-time and follow its laws. For this reason, we cannot observe or reveal virtual entities. But we can see their effects. One of these effects is that the speed of light in vacuum is the same and equal to c for all inertial observers. Reference frames, observers, measuring instruments and light entering the frame are all composed of CPH or subquantum energy and their transfer speed obeys the law of conservation of the amount speed. If we consider three inertial reference frames that move with different linear speeds relative to each other, when the light enters the measuring instrument of each of the frames, it is considered a part of the components of that frame. And as much as the linear speed of the frames has changed, the linear speed of the subquantum energies that make up the light will also change, and the speed of light in the vacuum will be constant and equal to c for the observer of that frame. For the first time in the CPH theory, the reason for the constant speed of light for all inertial observers was stated (figure 14).

It is possible to explain the apparent universe with mathematics, as quantum mechanics and special and general relativity can do so. But when we get to the hidden layers of the universe, where we cross the boundary of emergence and deal with tachyons and virtual particles, every assumption can be measured and tested, unless we explain the reality of virtual space-time so that we can examine any presupposition first with a theoretical approach. It has been more than three hundred years since Newton's extrastructural definition of acceleration entered physical equations. At that time, there was no discussion about the structure of matter, and the most important experimental observations of the cosmos were the moons of Saturn, which were seen by the most primitive telescopes. Today, along with telescopes that are of engineering masterpieces, we are involved in mysteries such as cosmic inflation and the acceleration of the universe, while physical theories and equations are stuck in the cramped and worn-out cage of extrastructural acceleration.



$$|V_{CPH}| = |V_G| > \left|V_{SQE}\right| > |c|$$

Fig 14: The speed of light in the vacuum is the same for all inertial observers

It is no coincidence that the physical laws are the same in all inertial reference frames. All the components of the inertial reference frame, even the incoming light, follow the same physical laws.

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