

Making up of Universe by Tiny Energy Including Unique Features

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Abstract

The Standard Model of particle physics describes the universe in terms of Matter (fermions) and Force (bosons). Particles of matter transfer discrete amounts of energy by exchanging bosons with each other. There exists an antiparticle for every fermion in nature. The simplest example which illustrates the involved principle is that of the electron and positron.

Quantum mechanics is a very good set of mathematical models that show how many elementary forces work, but it does not describe how they work. To understand and describe the mechanism of production and performance of force-carrying bosons, we need to reconsider force and energy. The left sides of the relativistic Newton's second and mass–energy equivalence equations, which with new approach to *F* and *E* (force and energy) has dealing in this paper.

This new approach shows what means transferring of discrete amounts of energy by exchanging bosons, and describes the mechanism of converting force-carriers to energy and vice versa.

Keywords: bosons, fermions, color charge, magnetic color, antimatter, photon, graviton, singularity, absolute black hole

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Introduction

In quantum electrodynamics (QED) a charged particle emits exchange force particles continuously. This process has no effect on the properties of a charged particle such as its mass and charge. How it is explainable? If a charged particle as a generator has an output known as a virtual photon, then what will be its input?

With a new approach to a pair production and decay e^+, e^- , we can get interesting results. Before a pair production, we have a photon and after, we have two fermions (electron and positron) in which each of them have their own electric fields. It means that electron and positron produce discrete amounts of energy by exchanging bosons – virtual photons - that can absorb each other. After a pair decay, electric fields are disappeared along with an electron and a positron. Therefore, it must be generalized the method of production and physical properties of the field from fermions to the structure of photon and vice versa. Also with such an approach, we can recognize the mechanism of electromagnetic interactions, then we can use it to describe strong and weak interactions, and describe the relationship between all fundamental forces.

We have started this article with reconsidering the pair production and decay electron - positron, and define the discrete amounts of energy by exchanging bosons between charged particles such as electron and positron. Other particles also have been observed to experience annihilation with their antimatter counterparts. Some of these processes are more complicated but all of them release radiation and the basic principles involved are the same¹.

Then following questions are answered that quantum field theory is unable to answer them, because quantum field theory (QFT) is the mathematical and conceptual framework for contemporary elementary particle physics, regardless to how fermions produce bosons and what the mechanism of exchanging bosons (or transferring the discrete amount of energy²) is.

- 1- How does a charged particle produce its electric field?
- 2- What is the amount of energy that is transferring by photons (electromagnetic interaction or exchanging photons)?
- 3- What is the mechanism of exchanging photons between charged particles?
- 4- If photon is made of electric and magnetic fields, what are those electric and magnetic fields made of?

Standard model is unable to answer these questions, because “It's only a model!” Interpretation of forces between particles as result of exchange of other particles is just a way of mathematically describing it, a successful way, because it lets us calculate the probabilities of various processes and compare the result with experiments, but it is still a model. No one has ever seen such exchanged particle, and it can't be seen by the definition, because it is virtual³. If we replace the

¹ - Don Cossairt, "Radiation from particle annihilation"

<http://www.fnal.gov/pub/inquiring/questions/annihilation2.html>

² - <https://home.cern/about/physics/standard-model>

³ - Jerzy Michał Pawlak, PhD in High Energy Physics (experimental) Written Sep 16, 2014 to answer the question: “How do exchange particles, whether they are gravitons, photons, gluons, or W and Z particles, generate a force?”

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force by transferring energy - momentum, all physical interactions are justifiable. Moreover, without using force, we can describe all physical processes and interactions.

It is notable that all photons have common physical properties except the value of energy and in addition to energy are carrying the momentum. To answer the above questions we need to review the relativistic Newton's second law.

The honest approach to three quantities of mass, energy and bosons (carriers of the fundamental forces) and the relation $E = mc^2$ lead us to conclude that everything is made up of energy. Therefore, understanding the physical nature of energy (photons), is a fundamental requirement in physics. On the other hand, the relationship between energy and frequency of photon shows (in addition the oscillation frequency), the frequency of photon depends on structure of photon.

So to generalize the relation between bosons and energy, we should start with gravity which is the weakest fundamental forces.

The smallest discrete amount of energy

Definition of the smallest discrete amount of energy is very vague and its detection is impossible. This ambiguity is due to reasonable restrictions based on experience, this is not just about physical limitations, even in mathematics we are dealing with some restrictions⁴. With all limits, behavior of photon in the gravitational field, helps we be able to define the smallest discrete amounts of energy [1]. Consider a photon with energy $E = h\nu$ is escaping from a strong gravitational field. By reducing the frequency of photon (photon energy reduction), intensity of electric and magnetic field are reduced too and finally, intensity of both the fields reaches to zero and the photon loses all its energy. Final limit for energy of photon before that reaches or tends to zero and still has spin, is equal to the smallest discrete amounts of energy that is given by:

$$\text{Smallest discrete amount of energy} < h\nu, \forall \nu \text{ detectable} \quad (1)$$

Regarding to gravity is the weakest fundamental forces which is transferring by graviton, relation (1) is defining the energy of graviton E_G that is given by:

$$E_G < h\nu, \forall \nu \text{ detectable} \quad (2)$$

Where G is symbol of graviton. And the mass of the graviton m_G is given by:

<https://www.quora.com/How-do-exchange-particles-whether-they-are-gravitons-photons-gluons-or-W-and-Z-particles-generate-a-force>

⁴ - Finally, mathematicians accepted that there is three undefined terms point, line and plane in geometry.

<https://www.reference.com/math/three-undefined-terms-geometry-97a228aecbb80a75>

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$$m_G < \frac{h\nu}{c^2}, \forall \nu \text{ detectable} \quad (3)$$

By presenting the graviton principle, we be able to describe how elementary particles such as photon and electron do form, and then we could describe the mechanism of the production of electromagnetic field, the strong and weak field.

Graviton Principle

Graviton is the most minuscule unit of energy with constant mass m_G that moves with a constant magnitude of speed V_G so that $|V_G| > |c|$, in all inertial reference frames. Any interaction between graviton and other existing particles represents a moment of inertia I where the magnitude of V_G remains constant and never changes. Therefore;

$$\nabla V_G = 0, \text{ in all inertial reference frame and any space} \quad (4)$$

There V_G is the total speed of transmission speed V_{GT} and non-transmission V_{GS} of graviton, so that:

$$|V_{GT}| + |V_{GS}| = \text{constant} = |V_G| > |c| \quad (5)$$

Based on the principle of graviton, a graviton carries two types of energy generated by its movement in inertial reference frame, one is transmission energy E_{GT} and the other one is non-transmission energy E_{GS} , So that;

$$E_G = E_{GT} + E_{GS} = \text{constant} \quad (6)$$

As the graviton mass and speed is constant, its energy remains constant and can only its transmission energy changes to non-transmission energy and vice versa. Gravitons combine with each other and produce the large amounts of energy quanta, and energy converts to matter and anti-matter. In fact, everything has been formed of graviton. This approach to graviton helps us to describe quantum vacuum and generalize the Maxwell equations from electromagnetism to the gravitational field.

Quantum vacuum fluctuations

All our theories today seem to imply that the universe should contain a tremendous concentration of energy, even in the emptiest regions of space. The gravitational effects of this so-

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called vacuum energy would have either quickly curled up the universe long ago or expanded it too much greater size. The Standard Model cannot help us understand this puzzle, called the cosmological constant problem [2]. For decades, there had only ever been indirect evidence of these fluctuations, but back in 2015, researchers claimed to have detected the theoretical fluctuations directly [3]. And now the same team says they've gone a step further, having manipulated the vacuum itself, and detecting the changes in these strange signals in the void [4].

The space is full of graviton. In during the density of gravitons increase in space, the distance between them decreases, but they do not attach to each other, their paths change without decreasing the magnitude of V_G . Let's use the gravitational blue-shift to describe what happen for gravitons.

When a photon in the gravitational field as Δr falls, graviton's density in the vicinity of the photon electric field changes the value as ∂G_E , because the intensity of electric field changes as E_G (E_G is the electric field arising from gravitons). In fact gravitons enter the structure of photon, and the intensity of electric and magnetic fields which depends on photon increases. Two types of gravitons should enter the photon structure, so that they are able to increase the intensity of photon electric field without any charge effect. Thus the interaction between gravitons and photon, negative and positive G^- , G^+ gravitons are produced and enter the photon structure. Let's call G^- negative color charge and G^+ positive color charge. The photon moves in the same direction as the increasing intensity of the gravitational field does, and the photon electric field is perpendicular to the photon movement direction that is compatible with the following equation:

$$\nabla \times \mathbf{E}_G = -\frac{\partial G_E}{\partial t} \Leftrightarrow i(\mathbf{G}^+, \mathbf{G}^-) \quad (7)$$

By changing the photon's electric field, magnetic field also changes. In this case also, the gravitons are converted into magnetic carrier particles G_m and enter into the structure of photon that is given by;

$$\nabla \times \mathbf{B}_G = \mu_0 \varepsilon_0 \frac{\partial E_G}{\partial t} \Leftrightarrow j(\mathbf{G}_m^+, \mathbf{G}_m^-) \quad (8)$$

Where i , j are natural numbers, for proportion between i and j see [5].

A photon of minute energy contains some positive color-charges \mathbf{G}^+ , negative color-charges \mathbf{G}^- , right rotation color-magnetic \mathbf{G}_m^- and left rotation color-magnetic \mathbf{G}_m^+ as shown in the CPH matrix as follows:

$$CPH = \begin{bmatrix} \kappa G^+ & \kappa G^- \\ G_m^+ & G_m^- \end{bmatrix} \quad (9)$$

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There κ is a natural number that shows relation between intensity of electric and magnetic in structure of photon [5].

Sub-Quantum Energy (SQE)

We use CPH matrix (equation 9) to define sub quantum energy (SQE). The first column of CPH matrix is defined positive sub quantum energy SQE^+ that is shown by operators, right wedge \triangleright and the second column of CPH matrix is defined negative sub quantum energy SQE^- that is shown by operators, left wedge \triangleleft , so;

$$\text{Positive Sub Quantum Energy } SQE^+ : \triangleright = \begin{bmatrix} \kappa G^+ \\ G_m^+ \end{bmatrix} \quad (10)$$

$$\text{Negative Sub Quantum Energy } SQE^- : \triangleleft = \begin{bmatrix} \kappa G^- \\ G_m^- \end{bmatrix} \quad (11)$$

The amount of speed and energy of positive and negative sub quantum energies are equal, and the difference between SQE^+ and SQE^- are only in the sign of their color-charges and magnetic-color flows direction (read more [5]).

Sub-Quantum Energy Principle

One SQE is a very small energy with mass m_{SQE} that moves with speed $|V_{SQE}| > |c|$ relative to inertial reference frame and in every interaction between $SQEs$ with other particles or fields the speed value of SQE remains constant; as in every physical condition we have;

$$\nabla V_{SQE} = 0, \text{ in all inertial reference frames and any space} \quad (12)$$

SQE principle (equation 12) 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;

$$|V_{SQE}| = |V_{SQET}| + |V_{SQES}| = \text{constant} \quad (13)$$

$$|E_{SQE}| = |E_{SQET}| + |E_{SQES}| = \text{constant} \quad (14)$$

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Virtual photons: there are two types of virtual photons, positive virtual photon γ^+ and negative virtual photon γ^- that each of them is formed of number same-sign sub quantum energies, which is defined as follows:

$$\text{Positive virtual photon; } k \triangleright = \gamma^+ \quad (15)$$

$$\text{Negative virtual photon; } k \triangleleft = \gamma^- \quad (16)$$

A real photon is formed of a positive virtual photon and a negative virtual photon:

$$\gamma^+ + \gamma^- = \gamma \quad (17)$$

$$(n \triangleright + n \triangleleft) = n(\triangleright + \triangleleft) \text{ or } n|\triangleright\rangle + n|\triangleleft\rangle = \gamma \quad (18)$$

There, n, k are natural numbers. So far, the production of electromagnetic energy (photons) was described by using gravitational blueshift, in reverse phenomena photons decay to negative and positive virtual photons. In redshift, virtual photons also decay to positive and negative sub quantum energies (SQEs), and sub quantum energies (SQEs) decay to color-charges and magnetic-colors, too. Color-charges and magnetic-colors away from each other, lose their effect on each other and become gravitons.

Light Speed

According to principle of *SQE* (which is also the result of the graviton principle) the amount of the linear speed of *SQE* depends to the interaction between *SQEs* and the other particles (or fields) in the medium. So, in a vacuum, photon (light) has not any interaction with other particles or fields outside of the photon structure, (assume gravitational effect of vacuum is negligible), thus, the linear speed of *SQEs* in the structure of photons are constant and equal to $V_{SQET} = c$. Also, the linear speed of virtual photons in a vacuum is the same amount of c . Let's in generally, show the speed of photons as v_{light} , it changes from one medium to another that in a vacuum is c , it means the speed of light in vacuum also is $v_{light} = c$. So that:

$$\nabla v_{light} = 0 \quad (19)$$

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Thus, the linear speed of photon depends to medium conditions. Same as gravitons and sub quantum energy, but the total amount of transmission speed v_{lightT} and non-transmission speed v_{lights} of photon is constant and it is equal to $|v_{light}|$, so we can write:

$$|v_{light}| = |v_{lightT}| + |v_{lights}| = constant \quad (20)$$

But in accelerating frame, as well as Einstein's General Relativity has made clear [6], is not constant and obeys presented as follows:

$$c' = c(1 \pm \frac{GM_s}{rc^2})$$

Now the question arises that how much change will increase or decrease the speed of light?

Reconsidering the relativistic Newton's second law

By proposing of the relativity and limit speed of light c , Newton's second law was corrected so that the limitation of speed must had applied. So the Newton's second law was as follows:

$$F = \frac{dp}{dt} = \frac{d(mv)}{dt} = v \frac{dm}{dt} + m \frac{dv}{dt} \quad (21)$$

According to CPH Theory, force was replaced by transferring energy - momentum, and energy moves with limit speed, relativistic Newton's second law was modified as follows;

$$F = \pm \frac{v}{c^2} \frac{dE}{dt} + m \frac{dv}{dt} \quad (22)$$

The \pm signs in equation (22) has been marked for two states of the increasing and decreasing energy (collinear or non-collinear directional variations in force and speed).

In fact, the external force cannot change the value of speed under any physical conditions and it just can change linear motion of formed particles of matter and energy to nonlinear motion and vice versa. With such insight, we can have better cognition from singularity by definition of absolute black hole, explain before big bang and express the reason of inflation (read more [5]).

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Singularity, Newton's second law contrasts with the law of universal gravitation

A gravitational singularity or space-time singularity is a location where the quantities that are used to measure the gravitational field become infinite in a way that does not depend on the coordinate system⁵. According to general relativity, the initial state of the universe, at the beginning of the Big Bang, was a singularity. Both general relativity and quantum mechanics break down in describing the Big Bang.

The question is, if the universe collapses, will it reach to infinite density and zero volume? Or is there a force that will counteracts it? In the following, according to reconsidering relativistic Newton's second law, the answer to Big Bang is explained and regarding the sub quantum energy, the Friedmann's equation is reviewed.

When Einstein first studied the universe at large using the General Theory of Relativity he discovered that his equations predicted a universe which was either expanding or contracting and this was contradicted with the best astronomical observations at the time. He then modified his equations to satisfy the observations. This modification corresponds to the assumption that the whole universe is permeated with a constant pressure (which in his case balanced the expansion yielding a steady universe). This universal pressure is called the cosmological constant Λ (lambda).

At almost exactly the same time, Friedmann carefully revised the Einstein's cosmological equations and he published his classic relativistic cosmology. Friedmann showed that there exist expanding solutions that are unbounded with hyperbolic geometry⁶. The differential equations⁷ that he derived were:

$$\left[\left(\frac{1}{R} \frac{dR}{dt} \right)^2 - \frac{8}{3} \pi G \rho \right] R^2 = -kc^2 \quad (23)$$

After Hubble discoveries on the universe's expansion, Friedmann's equation was as follows:

⁵ - Jos e M. M. Senovilla, "Singularity Theorems in General Relativity: Achievements and Open Questions." arXiv:physics/0605007v1, 2006

⁶ - MALCOLM S. LONGAIR, "A Brief History of Cosmology", Carnegie Observatories Astrophysics Series, Vol.2 Measuring and Modeling the Universe, 2004, ed. W. L. Freedman (Cambridge: Cambridge Univ. Press)
<http://www.astro.caltech.edu/~george/ay21/readings/longair.pdf>

⁷ - The Friedmann Equation,

https://ned.ipac.caltech.edu/level5/Peacock/Peacock3_2.html

<http://hyperphysics.phy-astr.gsu.edu/hbase/astro/fried.html>

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$$\left(H^2 - \frac{8}{3}\pi G\rho\right)R^2 = -kc^2 \quad (24)$$

Where $H = \left(\frac{1}{R}\right)\frac{dR}{dt}$ 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, 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.

As when a stone is thrown upward to a certain height goes up, the question is, light (a from the surface of a black hole to how high can go up? According to equations (12, 13) the speed V_{SQE} is constant, but the amounts of transmission speed V_{SQET} and non-transmission V_{SQES} are not constant, by decreasing the amount transmission speed of SQE is added to the non transmission speed and vice versa. Each of these values is maximum when another value is zero that is given by:

$$V_{SQET} \rightarrow V_{SQE} \Leftrightarrow V_{SQES} \rightarrow 0 \quad (25)$$

$$V_{SQES} \rightarrow V_{SQE} \Leftrightarrow V_{SQET} \rightarrow 0 \quad (26)$$

Thus, according to the direction of external force which was affected on a particle/object, the total non-transmission speeds rate is converted to the transmission speeds or to the inverse.

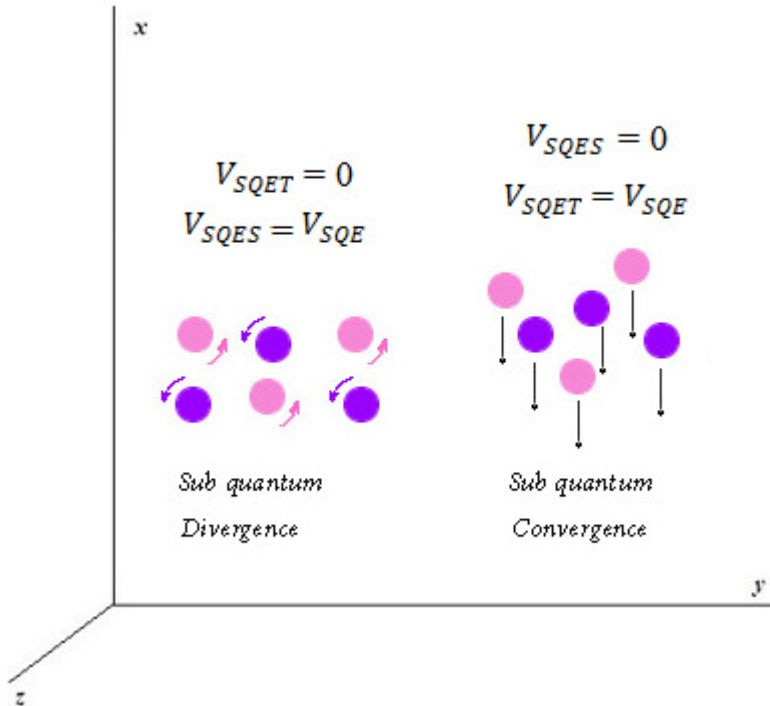


Fig1; Sub-quantum Divergence and Convergence

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Now we can define an absolute black hole. But before explanations, it is necessary to define two terms of sub quantum divergence and sub quantum converges;

1- 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 1). There is $V_{SQE} = V_{SQET}$ in the sub quantum divergence. So;

$$\text{Sub quantum Divergence; } V_{SQET} = V_{SQE} \Leftrightarrow V_{SQES} = 0 \quad (27)$$

2- Sub quantum Convergence: if total transmission speeds *SQEs* of a particle/object go to zero, $V_{SQET} \rightarrow 0$, we say that the object has sub quantum convergence (Figure 1).

There is $V_{SQES} \rightarrow V_{SQE}$ in the sub quantum convergence. So;

$$\text{Sub quantum Convergence: } V_{SQES} \rightarrow V_{SQE} \Leftrightarrow V_{SQET} \rightarrow 0 \quad (28)$$

Definition of an absolute black hole: If a particle/object falls down into the absolute black hole, it will be involved in sub quantum divergence before reaching the surface of the absolute black hole.

Consider the absolute black hole swallowing more matter; its mass and thus its gravitational field intensity will be increase. By increasing the mass, volume is reducing, its constituent *SQEs* is condensed and its transitional space will be limited.

Definition of Singularity: An absolute black hole with very high density under two followed conditions reaches the singularity state:

- 1) Its constituent *SQEs* reach sub quantum convergence state i.e. $V_{SQES} \rightarrow V_{SQE}$. So the linear speed of everything on the surface of absolute black hole goes to zero, $V_{SQET} \rightarrow 0$
- 2) Due to the gravitational pressure, the average distance between *SQEs* of an absolute black hole goes to zero.

Once the non-transmission speed of *SQEs* reach maximum, $V_{SQES} \rightarrow V_{SQE}$, the average distance between *SQEs* goes to zero due to intensive collision.

They are scattered around and these chain scattering are spread everywhere inside the absolute black hole and therefore the singularity is occurred. The density is very high in the singularity state, but not infinite. In addition, the volume does not reach to zero, but the average the distance between *SQEs* reach to zero. Given above descriptions can easily explain counteracting Newton's second law and gravity.

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Given the above themes, there are three basic limitations: transmission speed, non-transmission speed and density that they are the reason of creation the observable universe and all physical phenomena existing in it.

Now, by using the equations (27 and 28), the Friedmann's equation (23) and then the Big Bang will be reviewed.

Right side of the Friedman equation, has given for real space-time and is used for after the Big Bang, because k determined the geometrical properties of space-time and c is the speed of light in a vacuum is constant, but given that the speed of light is not constant in gravitational field (equation 20) and it is zero for surface and inside of an absolute black hole (equations 27 and 28). So if we want to solve the Friedmann's equation for absolute black hole, we must consider the speed of light to zero and the equation becomes as follows:

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

Assuming $R \neq 0$ (which is a reasonable assumption because the notion that, if the universe collapses, it will not vanish volume and it is not reasonable that universe was created of nothing), then we have:

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

Radius of the universe is shrinking over time that is given by:

$$R = R_0 e^{\sqrt{\frac{8}{3} \pi G \rho} t} \quad (29)$$

Equation (29) is an exponential function that shows in the first moments after the explosion, expansion of the universe was very fast. In addition, because of the big bang, Newton's second law contrasts with the law of gravitational law, in this confrontation, Newton's second law, and the universal gravitational law is neutralized. In the early moments after the Big Bang the speed limit was not the speed of light c , because *SQEs* collide with each other, everything, even the photons were decomposed and the speed limit could have one of two values *SQE* speed V_{SQE} or the speed of graviton V_G . So, we can write:

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$$\left[\left(\frac{1}{R} \frac{dR}{dt} \right)^2 - \frac{8}{3} \pi G \rho \right] R^2 = -k V_{SQE}^2 \quad (30)$$

Classical mechanics and relativity (special and general) describe the acceleration is an explanation of outward of phenomena regardless of the properties of sub quantum scales. It should be noted that the interaction between large objects (e.g. collision of two bodies) under the action of the quantum layer (in fact sub quantum layer) done. In sub quantum level, the amount of speed is constant, in any condition and any space, and in any interaction linear momentum changes to nonlinear momentum and vice versa. According to *SQE*, we are able to show there is not a zero volume with infinite density in singularity also before the Big Bang. So, regardless to reconsidering the relativistic Newton's second law, how can we resolve the dark energy problem?

Perhaps still in the aftershocks of the Big Bang to take over the universe. In addition, there is no proof for the existence, be limited to the observable universe, or owes its existence not earlier collapse (read more [5]).

Structure of photon, matter and anti-matter

Matter-antimatter asymmetry is one of unsolved problems in physics, and various solutions have been propounded. But the antimatter problem is not solved yet, and by modern physics approaches will never be solved. When the concept of antimatter entered the physics? For the first time antimatter was predicted in Dirac's equation and Sea. If we want to resolve the matter - antimatter problem radically, we need to review the Dirac's Equation and Sea carefully by a new approach on the antimatter concept. The root of the problem can be attributed to the left side of the $E = mc^2$ relation. The Dirac's equation is usually limited to the high energy photons and the pair production and decay of a particle - antiparticle, while Dirac's Sea can be used for all quanta of energies. In relativistic quantum mechanics, the problem is that Dirac equations cannot explain virtual pair production and decay in a vacuum⁸. That's why uncertainty principle is used to justify the virtual pair production and decay in vacuum. In general case, we use a closely related of Dirac matrices that is defined as follows⁹:

$$\gamma = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \quad (31)$$

⁸ - http://abyss.uoregon.edu/~js/21st_century_science/lectures/lec14.html

⁹ - Dirac Matrices, <http://mathworld.wolfram.com/DiracMatrices.html>
http://www.nyu.edu/classes/tuckerman/quant.mech/lectures/lecture_7/node1.html

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By considering the β matrix "Dirac basis", and using \triangleright and \triangleleft for positive and negative sub quantum energies in which k is a natural number, we can write the virtual photon matrix as follows:

$$\gamma mc^2 \rightarrow \begin{bmatrix} k \triangleright & 0 \\ 0 & k \triangleleft \end{bmatrix} \quad (32)$$

In relation (32), $k \triangleright$ is positive virtual photon γ^+ , that carries positive electrical force and forms positive electric field and $k \triangleleft$ is negative virtual photon γ^- that carries negative electric force and forms negative electric field. Every real photon is formed of two virtual photons. Therefore, we will have:

$$\gamma^+ = k \triangleright, \gamma^- = k \triangleleft \rightarrow \gamma = \gamma^+ + \gamma^- \quad (33)$$

In special case, for pair production, we have:

$$\gamma \rightarrow (\gamma^+ = k \triangleright) + (\gamma^- = k \triangleleft) = e^+ + e^- \quad (34)$$

$$e^+ = k \triangleright \text{ and } e^- = k \triangleleft \quad (35)$$

Relations (34 and 35) show a positive charged particle is made up of a set of positive sub quantum energies $k \triangleright$ and a negative charged particle is made up of a set of negative sub quantum energies \triangleleft . It is notable that in generally, there is not different between matter and antimatter in structure of photon (read more [7]).

As charged particles absorb or repulse each other and are ineffective on neutral particles, homonymous virtual photons repulse each other, non-homonymous virtual photons absorb each other and they form quantum energies and it causes two non-homonymous charged particles accelerate towards each other (read more [7]).

Therefore, in CPH theory, defining the structure of photon by means of Dirac equation is in fact a physical reality that not only it satisfies about anti-particles, but also it is an inseparable part of the nature [5 and 7]. Consider a charged particle (e.g. an electron) that creates an electric field around itself and constantly is spreading (propagating) virtual photons. Here according to the sub quantum energies \triangleright and \triangleleft , the mechanism for generating electric fields, the dynamics of attraction and repulsion between charged particles are analyzed.

Electron is a set of negative color-charges (or negative SQEs) that are preserved by electromagnetic field due to its surrounding magnetic-colors. This rotational sphere (spinning electron) is adrift (floating) in a sea of gravitons and as it already was explained, gravitons are converted to positive and negative color charges in vicinity of electron. There is same explanation for positron. Therefore, we can define an operator that expresses the process of producing positive virtual photons by electron. If we show this operator with $\triangleleft s$ that effects on electron and it is respect to time of γ^+ , it means that it creates the carrier of positive electromagnetic force, then we have:

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$$\frac{d}{dt} \triangleleft s(G^+) = a \triangleright = \gamma^+ \quad (36)$$

There a is a natural number. As the same way, positron behaves like electron that is similar to a generator and it produces and propagates negative virtual photons (Figure 2) and then we have:

$$\frac{d}{dt} \triangleright s(G^-) = a \triangleleft = \gamma^- \quad (37)$$

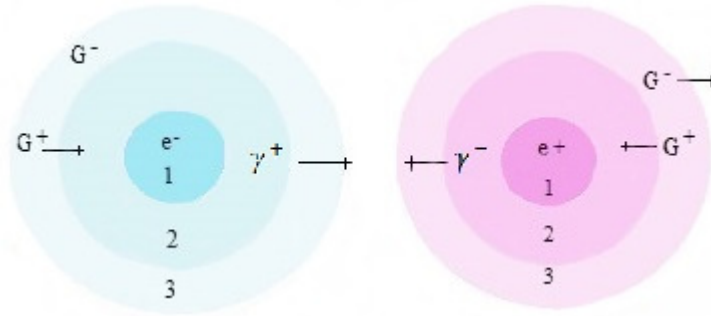


Fig2: Electron and positron are attracted each other by positive and negative virtual photons.

When $a \triangleright = \gamma^+$ from the electron reaches to area 2 of positron, it combines with $a \triangleleft = \gamma^-$, and a real photon is created and is absorbed by positron, then positron accelerates toward the electron.

Positron gets energy $\gamma^- + \gamma^+ = \gamma$ and accelerates toward the electron.

The similar mechanism happens for electron, when $a \triangleleft = \gamma^-$ reaches from positron to area 2 around electron, combines with $a \triangleright = \gamma^+$ and creates a real photon. (Figure 3). Then, we have:

$$\begin{array}{c} \frac{d}{dt} \triangleleft s(G^+) = a \triangleright = \gamma^+ \\ \downarrow \\ \uparrow \\ \frac{d}{dt} \triangleright s(G^-) = a \triangleleft = \gamma^- \end{array} \quad \begin{array}{c} \text{~~~~~} \\ \gamma \end{array}$$

Fig3: Production and combination of virtual photons by electron and positron

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According to $\gamma^+ + \gamma^- = \gamma$, it can be explained very well that why carrier photons of electromagnetic force are not visible. The production process of virtual photons by using sub quantum energies is explainable. This explanation is based on physical fact that a photon is formed of two sets of positive and negative color-charges in which each of them has its own dependent magnetic field. Production of virtual photons occurs like radiation of charged particles with a specific frequency. It means that any charged particle with just one turn of a spinning movement creates and emits a virtual photon. In fact, every turn in spinning movement of charged particle can be considered like oscillations that causes radiation and creates a virtual photon. Virtual photons move with linear speed c and form electric field around a charged particle. Any charged particle that lies in this field, will have interaction with existing virtual photons in this field.

Note: According to above descriptions, it is observed that the energy is generated by field, and matter is generated by energy, so we can say that in CPH theory, energy is intensive field and matter is a dense energy. And universe is made up of a tiny energy that includes the unique main features (read more [5]).

Sub Quantum Chromodynamics

Strong interaction is the factor of integration among large number of positive charged particles in nucleus of atom. Therefore, it is stronger than electric repellent force among existing positive charged particles in the nucleus. For example, proton is formed of 3 quarks, two up quarks (u) with $(+\frac{2}{3})$ electric charge and a down quark (d) with $(-\frac{1}{3})$ electric charge p(udu). The subject that how two quarks gather together with homonymous charged particles is another problem that still there is some theoretical problems¹⁰ and intuitive justification about that in modern physics that can be consistent with experiments.

The reason and mechanism of strong interaction is easily explainable by using sub quantum energies. In general state, we suppose that two positive electric charged particles A^+ , B^+ , lie in a bigger distance of the radius of proton. As explained in the previous section, each positive charged particle repels positive color-charges and absorbs negative color -charges. The magnetic field around it compacts these negative color-charges and emits it as negative virtual photon in the space. When the distance between these two particles is high (more than the radius of nucleus of atom), before that emitted negative photon γ^- reaches from second particle to first particle, repelled positive color-charges by first particle have left the environment (they have got away from the charge surroundings). While in short distances, the repelled positive color-charges by a particle combines with negative color-charges around another particle and create electromagnetic energy.

¹⁰ - Matthew Francis, "Glueballs are the missing frontier of the Standard Model", Ars Technica, 2015

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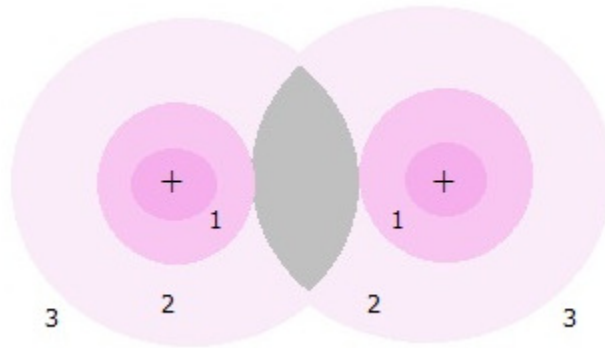


Fig4; interconnect two positive charged particles

Suppose that the particle A^+ produces a negative virtual photon γ^- in the time dt , it repels a number of positive color charges that can produce a positive virtual photon γ^+ . If we consider the distance between these two particles, supposing speed of γ^- is at least equal to speed of light c , if $d > cdt$, the repelled positive color-charges by each particle is ineffective on negative color-charges around the second particle. If $d < cdt$, the mechanism of attraction and repulsion of color-charges by each particle interfere with the mechanism of the other particle, positive and negative color-charges are converted to electromagnetic energy and these two particles absorb each other. Because if $d < cdt$, the binding energy between two particles A^+ , B^+ is stronger than repulsive electrical force between them. But if $d = cdt$, then the electrically charged particles are neutral with respect to each other (figure4), which can produce vector bosons (weak nuclear interaction), so behavior of electromagnetic and weak nuclear interactions are very similar.

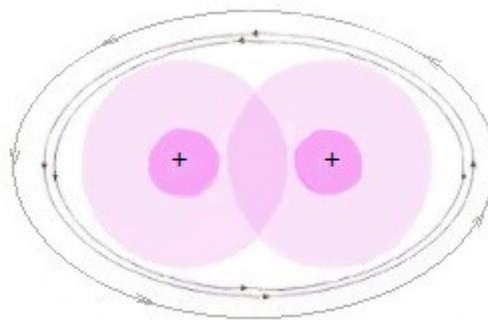


Fig5: The magnetic field around two same charged particles

Nuclear fusion in the center of stars is repeating this process. When two homonymous charged particles became close enough to each other, their magnetic fields are united and keep together these homonymous charged particles like plasma of charged particles (figures 5 and 6). In the center of the stars, due to high speed (transitive energy) of nuclues of atoms, they come close

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enough together and protons (in fact quarks) fall in each other color-charges areas and provide the necessary binding energy and nucleuses do fusion. There are many protons (in fact quarks) in a heavy nucleus, the number of quarks can have common color-charges area and absorb each other.

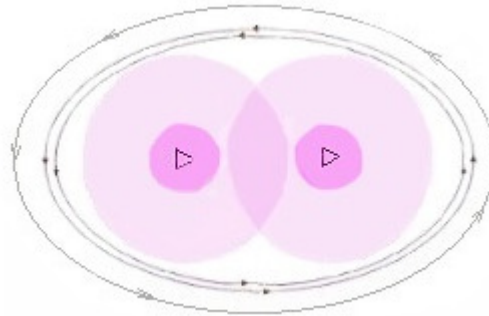


Fig6: Magnetic field around two same *SQEs*.

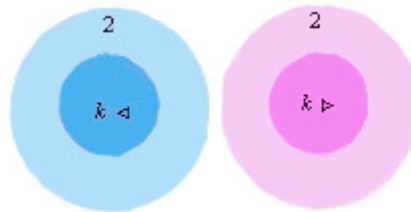


Fig7: A photon is formed of $\triangleright + k \triangleleft$, but magnetic fields around \triangleright (s) and \triangleleft (s) prevent them from this combination

In standard model of particle physics, any particle has its ant-particle. In fact, matter and antimatter are identical (figure 7). Standard model cannot answer to this question that why in our universe the amount of matter is more than anti matter. In other words, around us, there exist lots of matter, but antimatter does not observe. In CPH theory, the symmetry between positive and negative sub quantum energies (\triangleright and \triangleleft) is important, not the number of equality between the number of particles and anti-particles (read more [5]).

Review the Physicists show EVERYTHING happens at the same time

Physicist Max Tegmark claims flow of time is illusion. EVERYTHING happens at the same time. The theory is backed up Einstein's theory of relativity, Max Tegmark said. [8]

To understand how this theory is consistent with the truth, it should be compared with physical previous theories and experiences.

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According to old theories, does everything happen at the same time? In thermodynamics and classical mechanics, the time has an arrow from the past to the future and everything does not happen at the same time.

In special relativity, time dilation in special relativity must be investigated along with contraction of length. Because they are inseparable from each other. Contraction of a physical object means compactness of atoms and sub atomic particles. Whatever atoms are compacted more to each other, the radiation of system decreases for any reason that is considered. In addition, time dilation in general relativity happens by reduction of volume, due to gravitational pressure. The clock that is on the earth is under gravitational pressure more than a clock that lies at the top of a mountain. It means that all physical existents experience "time passing" in general and special relativity [5].

In CPH theory, a fundamental particle is a particle that is not decayed under any condition or is not convertible into other particles. Such a particle must be constant mass (energy), therefore, the amount of speed must not change. By this definition of fundamental particles, that standard model presents, particles are not fundamental, because their masses are not constant and they are convertible to energy. This phenomenon holds for other fundamental particles in standard model even for photon, because energy of photon is variable (for example in gravitational field) and in pair production, a high energy photon converts to electron-positron. As the same way, it can be shown that even photon experiences time passing. In fact, a fundamental particle must not experiences time passing, and all other particles are made of it even quantum fields.

What is the physical nature of time?

Assume that the observable universe would collapse due to gravity. Again, a new universe appears by another big bang. We suppose a smart existent like human lives in the next universe, the question is: How he/she will know that we have lived before him/her? All the materials in the observable universe converted to energy and energy converted to matter again. How do we know there was a universe before the present universe or it has not been existed at all? We do not know the answer of this question. However, we know that any physical existent in this universe does not destroy and just it converts to another thing, converting energy to mass and vice versa, in fact, field converts to energy, energy converts to matter-antimatter and vice versa.

According to $|V_G| > |c|$, every visible (detectable) physical being decay. But graviton does not decay, in the other word; time does not pass of graviton; the reason is that graviton does not decay to other physical being. Graviton's life is independent of time. It exists and moves in an imaginary space that for human being is not conceivable. Graviton carries information and moves so much faster than light speed. According to color charges and magnetic colors $G, G^-, G^+, G_m^-, G_m^+$, in fact graviton is pure information that for a real observer it moves with infinite speed.

The fact is that the Earth, solar system and the universe existed before us and after us will exist too. Human as a clock compares himself with older clocks, and from this comparison concludes that there exist something that is called time, and the time is independent of physical existents. While any attempt to explain or define time, independent of physical existents has been inconclusive. A physical existent with its own space and time forms its special shape and after a number of ticking, decays or converts to other physical existent.

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Simple and clear, EVERYTHING happens at the same time. In the other words, everything is made up of elements that never do experience "time passing" and they are seeing EVERYTHING happens at the same time. [9]

Photon is a very weak electric dipole

Scientists at the Centre for Quantum Technologies (CQT) at the National University of Singapore have just shown that a photon's shape also affects how it is absorbed by a single atom. We don't often think of photons as being spread out in time and space and thus having a shape, but the ones in this experiment were some four metres long (figure 8). Christian Kurtsiefer, Principal Investigator at CQT, and his team have learned to shape these photons with extreme precision. For the research, published 29 November in **Nature Communications**, the team worked with Rubidium atoms and infrared photons. They shone the photons one at a time onto a single atom.

A four-metre photon takes about 13 nanoseconds to pass the atom. Every time a photon was sent towards the atom, the team watched to see if and when the atom got excited. By noting the excitation times and collecting them together, the researchers could map the probability of the atom absorbing the photon as a function of time. The team tested two different photon shapes - one rising in brightness, the other decaying. Hundreds of millions of measurements made over 1500 hours showed that the overall probability that a single Rubidium atom would absorb a single photon of either type was just over 4%. However, when the team looked at the process on nanoscale timeframes, they saw that the probability of absorption at each moment depends on the photon's shape [10].

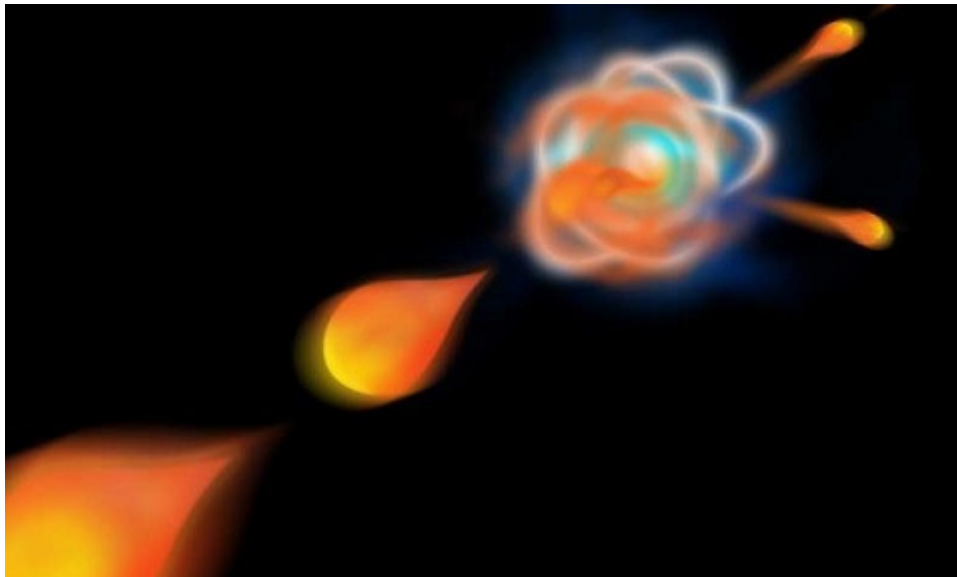


Fig 8: Scientists at the Centre for Quantum Technologies at the National University of Singapore have shown that a photon's shape affects how it is absorbed by a single atom. This artist's illustration is not to scale: in the experiment the photons are some 4 meters long, while the atom is less than a nanometer wide. Credit: Timothy Yeo / Centre for Quantum Technologies, National University of Singapore.

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This experiment is incompatible with the concept of point-like particles. In quantum mechanics, the concept of a point-like particle is complicated by the Heisenberg uncertainty principle, because even an elementary particle, with no internal structure, occupies a nonzero volume. There is nevertheless a distinction between elementary particles such as electrons, photon or quarks, which have no internal structure. In CPH theory photons are combination of positive and negative virtual photons. Photon is a very weak electric dipole that is consistent with the experience and these articles are asserted. In addition, this property of photon (very weak electric dipole) can describe the absorption and emission energy by charged particles.

In previous sections (figure 2), it was considered just a path, it was assumed that the positive virtual photon moves on a specified path and goes from the side of electron toward positron and combines with negative virtual photon produced by positron and accelerates to positron that is not apparently consistent with quantum mechanics. Because in classical mechanics, just a path indicates the motion of the particle, while all paths for a particle in quantum mechanics can be considered, even routes that is similar to the classic route. However, it is not true, a positive virtual photon can move on all possible routes to reach positron or not. It is important that not only electron is producing and emitting positive virtual photons continuously, but also a lot of positive virtual photons are moving in electrical field of electron, each of them has been entering to area 2 of positron, it would do the same action as described above. It is important that we understand the mechanism of this action and explain in a way that is consistent with the basic laws of physics.

A comparable example is forming snowflake. Due to perching in different conditions while forming, snow crystals possess complicated shapes with many details and then due to existence of many probable states, probability of finding two snow crystals with completely similar structure is very poor.

But we can understand and describe what happens in interaction between cold air molecules and water drops. For this reason, CPH Theory is able to describe the mechanism of production virtual photons and their interaction, but the standard model cannot.

CONCLUSION

Physics has encountered numerous problems and unanswered questions. Physicists are trying to solve the physics problems in the context of modern physics or to think the beyond of the modern physics, while they have not cared classical physics. Some physicists believe that by combining general relativity and quantum mechanics, these problems may be resolved and the unanswered questions will be answered.

In all of these efforts, the classical physic has been ignored, while nature is unique and all physical phenomena, from the microscopic or the macroscopic ones are obeying the same law. Therefore to solve the contemporary physics problems, the basic concepts and relations of physics should be the foundation of classical mechanics which have to be reviewed and

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analyzed. Then, we have to combine these three theories of classical mechanics, quantum mechanics and relativity in order to reach to a unique physics [12]. Eventually, by answering the unanswered questions, the physics problems will be solved.

It should be noted that the interaction between large objects (e.g. collision of two bodies) under the action of the sub quantum layer done [13].

Attention to photon structure and using new definitions for graviton, charged and exchange particles will change our perspective on modern physics. It also provides us with a new tool to be able to overcome physics problems in a better way [14].

In addition, the root of the quantum gravity problem is that physicists want to solve the quantum gravity problem regardless to the classical mechanics. Thus CPH Theory, from a new approach, turns out to merge the fundamental principles of quantum physics, relativity and classical mechanics.

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