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Non-Schrödinger Orbitals

Perspective on Relativity Theory

Highlights

Color of Flavor of Leptons

Static Isotropic Gravitational Field

Discovering Thoughts, Inventing Future

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A New Perspective on Relativity Theory

By Toshiaki Ishikawa

Abstract- The particular theory of relativity was created by Albert Einstein in 1905. As the starting point for this theory, he adopted two principles from the beginning: the "principle of relativity" and the "principle of the constancy of the velocity of light." Later, when it was pointed out that the velocity of light changes within the solar system (in a gravitational field), he argued that the velocity of light does not appear to be constant due to the "spatial distortion." He then constructed the general theory of relativity that took into account the "spatial distortion."

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ANEWPERSPECTIVEONRELATIVITYTHEORY

Strictly as per the compliance and regulations of:

A New Perspective on Relativity Theory

Toshiaki Ishikawa

Abstract- **The particular theory of relativity was created by Albert Einstein in 1905. As the starting point for this theory, he adopted two principles from the beginning: the "principle of relativity" and the "principle of the constancy of the velocity of light." Later, when it was pointed out that the velocity of light changes within the solar system (in a gravitational field), he argued that the velocity of light does not appear to be constant due to the "spatial distortion." He then constructed the general theory of relativity that took into account the "spatial distortion."**

The analysis here began by considering the underlying evidence in the preceding article. First, by considering the starting point of the relativity theory, I discovered that differential equation is hidden in the relativity theory. Since the differential equation has already been obtained, not only the one-dimensional equation of motion but also the two-dimensional equations of motion of the planet and light quantum have already been derived. The results of this detailed analysis prove that "spatial distortion" does not exist, and that the general theory of relativity has no meaning at all in terms of physics. In the end, the entire relativity theory was elucidated for the first time in the world.

Keywords: particular relativity theory, general relativity theory, motion equation of planet, motion equation of light, corpuscular character of light, planetary perihelion, lorentz's ether theory, spatial distortion, escape from gravity, quantum mechanics.

I. Introduction

This essay is designed to explain in detail on the underlying evidence in the preceding article[1)]. Although the preceding article elucidated the overall picture of the relativity theory, there remain many gaps in the explanation of related matters and many questions regarding the development of the theory. The purpose of this essay is to resolve these points.

The work here began by improving the starting point of the relativity theory. It is well known that Dr Einstein started his relativity theory with two principles: the principle of relativity and the principle of the constancy of the velocity of light. First, I consider the first principle, the "principle of relativity." That is, the measured values obtained in each coordinate system are expressed by a "common function" that shows a certain relationship (Lorentz transformation). This principle of relativity is an epoch-making idea that is only allowed for inertial coordinate systems based on the particular theory of relativity (PTR). This is because if there is such a "common function" between the stationary system and the accelerated coordinate system, the acceleration of the accelerated coordinate system should be included in that function. However, since there is no room for the acceleration of the accelerating system to enter the stationary system, there is no "common function" between the stationary system and the accelerated coordinate system.

Next, I will take up the second starting point, the principle of the constancy of the velocity of light. Literally speaking, this means that the velocity of light always remains constant under any circumstances. However, in response to the fact that light rays are curved within the solar system (in a gravitational field), Dr Einstein proposed a "spatial distortion" while still adhering to the "principle of the constancy of the velocity of light." The development of this "spatial distortion" led to the later general

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theory of relativity (GTR). On the other hand, it is known that the velocity of light in a medium is inversely proportional to the refractive index of the medium. The phenomenon in which light rays passing through the atmospheric layer near the ground is curved is called "atmospheric difference," and it is a well-known fact that the velocity of light changes.

In any case, there are two points: the velocity of light is not constant regardless of whether it is in a medium or not, and the "principle of relativity" is valid in the PTR. These will be used as the basis for later theoretical development.

II. Hidden Differential Equation

a) *Existence of Differential Equation*

It is well known that the PTR was proposed by Dr Einstein in 1905. Dr Einstein proposed the existence of a "common function" when measured values obtained between inertial coordinate systems show a certain relationship (Lorentz transformation), and expressed this as the "principle of relativity." As the second principle that should play a role in determining the functional form of this "common function," he proposed the "principle of the constancy of the velocity of light," which states that the velocity of light is always kept at a constant value. This was the birth of the PTR. This theory attracted a lot of attention around the world because it resolved experimental facts that could not be explained by Newtonian mechanics. As a result, most people believed it blindly and no one questioned it. However, as pointed out in the previous chapter, the velocity of light changes, so the "principle of constancy of the velocity of light" is not appropriate as a starting point for a theoretical system. Therefore, a situation arose in which it was necessary to search for a new second principle of the relativity theory.

The second and most effective principle is "relativity in space (the receding velocity of the coordinate origin of each inertial system are equal)," which has the necessary and sufficient conditions for determining the functional form. Now, let us consider an inertial system that is moving in a straight line at a constant velocity with respect to a stationary system. The image of an inertial system starts with ships, trains, airplanes, etc., and ends with "light." The function F used in the "principle of relativity" is expressed as

$$F = F(t, x, y, z),$$

where time is t and the coordinates are x, y and z. Using this, the principle of relativity is expressed as

$$F(t_0, x_0, y_0, z_0) \equiv F(t_1, x_1, y_1, z_1),$$

where the value of a natural phenomenon measured in the stationary system K_0 system is indicated by the subscript "0," and the value measured in the inertial system K_1 system is indicated by the subscript "1." In fact, the "relativity in space" makes it meaningful to differentiate the equation of the principle of relativity with respect to the receding velocity v. In other words, if the receding velocity v is included in the function F, the equation of the principle of relativity becomes

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$$F(t_0, x_0, y_0, z_0, v) \equiv F(t_1, x_1, y_1, z_1, v). \quad ①$$

On the other hand, the receding velocity usually changes for some reason; if the inertial system is a ship, it is hit by a large wave, or if it is a train or airplane, it is hit by a gust of wind, and so on. Here, if the receding velocity changes slightly (dv), due to "relativity in space," Equation ① becomes

$$F(t_0, x_0, y_0, z_0, v + dv) \equiv F(t_1, x_1, y_1, z_1, v + dv). \quad ②$$

In this case, Equation ① gives a necessary condition and Equation ② gives a sufficient condition. As a result, if we subtract both sides of Equations ① and ② and divide by dv, we get an equation that partially differentiates both sides of Equation ① with respect to v (in this case, the differential operation is not an ordinary differential because the receding velocity has no effect on natural phenomena.). Therefore, as an essential property, the relativity theory has a hidden differential equation, and unless we seek it, the relativity theory can never be solved. And once again, the unnatural aspect of the "principle of the constancy of the velocity of light" becomes clear. In other words, if the inertial system becomes "light," Equation ② does not hold and a differential equation cannot be obtained.

b) Necessity of Differential Equation

Dr Einstein won the Nobel Prize in 1921 for his "Light quantum Hypothesis" (when light and electrons collide, the light shocks the electrons). At that time, he famously said, "the light has no weight, but it has impact." However, as a physical fact, the "Light quantum Hypothesis" means that light quanta have the "corpuscular character," which means that light quanta have mass.

The reason Dr Einstein went wrong was that he could not find hidden differential equation. Differential equation always has a constant of integration, and in this case, it is the universal velocity that the velocity is always kept constant. Dr Einstein's mistake was to intuitively replace the universal velocity with the velocity of light. In other words, from the essence of physics, he had to distinguish between the universal velocity and the velocity of light. Expressed as a formula, it is as follows; let the mass of the light quantum be δm, the momentum representing the impact force be p, and the universal velocity and the velocity of light be c and c_0, respectively, then

$$p = \frac{\delta m}{\sqrt{1 - \frac{c_0^2}{c^2}}} \cdot c_0. \quad ③$$

Therefore, when $\delta m > 0$, $c > c_0$. By the way, Einstein's mistake was to adopt $c = c_0$ ("principle of constancy of the velocity of light"). This is because the denominator of Equation ③ is always zero, so we had to set $\delta m = 0$.

III. Derivation of Differential Equation[2)]

This chapter is a Japanese-English translation of an excerpt from the reference literature[2)].

a) Introduction

Looking back at the history of academic fields, not just physics, the following can be said without exception: The level of understanding of the researcher who published the article and the researcher who read it cannot be the same. In some cases, the presenter's intention may be completely misunderstood and communicated to the reader, leading to new developments. As Dr Einstein said, it is important to "understand things in your own way" when it comes to learning. Therefore, it is a very natural idea to discuss alternative interpretations and expressions of the published articles.

Although the purpose of the article (hereafter referred to as Hattori's article) that caused the recent controversy is good, on the other hand, the purpose of the discourse article that refuted it is extremely regrettable. In other words, the attitude of not accepting anything other than Einstein's expressions is the same as what was once said in medieval Europe; "Do not research anything other than what is written in the Bible." After all, a rebuttal should take the form of an academic article, and I believe that the main point is to go into the content of Hattori's article and express objections.

Although it may not resolve the controversy, I will try to develop one aspect of the PTR. The conclusion is similar to Hattori's article and others, but the process leading up to it was designed to be understandable even to science students.

b) Basic Concept

In the relativity theory, we discuss what kind of relational expression holds between the measured values when the motion of a particle is measured separately in two coordinate systems. The two coordinate systems in the PTR can be expressed as follows; for convenience, one is called a stationary system K_0, and the other is an inertial system K_1 that is moving at a constant velocity v with respect to the K_0 system. For example, assume the K_0 system is a coordinate system fixed to the ground, and the K_1 system is a coordinate system fixed to a train that continues to run at a constant velocity. The motion of a ball hit by a baseball batter is measured separately from the ground and from the train, and the measured values are compared.

In the PTR, the "principle of the constancy of the velocity of light" plays an essential role and cannot be ignored, but there is no reason to consider it from the beginning. In other words, I think it is meaningful to discuss where the principle of the constancy of the velocity of light can be used to deepen our understanding of the PTR. In order to do this, in addition to the principle of relativity, the basic premise is the symmetry and relativity in space, and the uniformity of time and space.

c) Deployment

The PTR can be written as the "laws of physics are expressed in an invariant form in any inertial system." Therefore, we need a function to express it. In other words, if the time t, coordinates x, y and z are variables, it is generally set as

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$$F = F(t, x, y, z). \quad ④$$

Using this, the particular principle of relativity is given by

$$F(t_0, x_0, y_0, z_0) \equiv F(t_1, x_1, y_1, z_1), \quad ⑤$$

but each variable has the following meanings; the value measured at a certain particle in the K_0 system is the subscript "0," and the value measured in the K_1 system is the subscript "1." By the way, Equation ⑤ shows a certain kind of symmetry because the coordinate axes can be chosen independently. This places a restriction on the form of Equation ④, and

$$F(t, x, y, z) = P(t) + Q(x) + Q(y) + Q(z). \quad ⑥$$

The reason is as follows; for example, when the y and z axes of the K_0 system are parallel to those of K_1 system, and the origin of the K_1 system is moving in the positive direction on the x axis of the K_0 system at a constant velocity v, since it is true $y_1 = y_0$ and $z_1 = z_0$, substituting into Equation ⑤ gives

$$F(t_0, x_0, y_0, z_0) \equiv F(t_1, x_1, y_0, z_0),$$

which does not explicitly include y_0 and z_0, as a result. Considering points with the same x coordinates in the K_0 system, the x coordinates will also be the same in the K_1 system. In other words, in this case, both t and x are not included in the conversion formula for y_0 or z_0. Furthermore, by considering the symmetry of the coordinate axes, it can be written as in Equation ⑥.

So, let us consider about the conversion of the K_0 system and the K_1 system (the time is set to zero when the origins of both overlap). In this case, from Equation ⑥ if it is used as

$$G = G(t, x) = P(t) + Q(x), \quad ⑦$$

the principle of relativity can be expressed instead of Equation ⑤ as

$$G(t_0, x_0) \equiv G(t_1, x_1). \quad ⑧$$

The conversion formula to be found is based on the x coordinate and the time t of a certain particle measured in each system, and can generally be written as

$$x_1 = f(t_0, x_0), \quad t_1 = g(t_0, x_0). \quad ⑨$$

However, we will introduce the following concept here; that is, the constant velocity motion of a particle seen in the K_0 system also appears to be the constant velocity motion in the K_1 system (uniformity of space and time). Therefore, the equation is written as

$$k \cdot \{f(t_0 + \Delta t_0, x_0 + \Delta x_0) - f(t_0, x_0)\} \equiv$$
$$f(t_0 + k \cdot \Delta t_0, x_0 + k \cdot \Delta x_0) - f(t_0, x_0),$$

and the formula written as g instead of f holds true for any k. From now on, the functions f and g become linear expressions of t_0 and x_0 (proof omitted). However, when the origins $x_0 = 0$ and $x_1 = 0$ are from the initial condition, the times $t_0 = 0$ and $t_1 = 0$ become. Moreover, since $x_0 = v \cdot t_0$ is derived by the origin $x_1 = 0$ of the K_1 system when viewed from the K_0 system, it can be said that x_1 is proportional to $(x_0 - v \cdot t_0)$. Thus, Equation ⑨ is expressed as

$$\left.\begin{aligned} x_1 &= (x_0 - v \cdot t_0) \cdot A(v), \\ t_1 &= (t_0 - B(v) \cdot x_0) \cdot C(v), \end{aligned}\right\} \qquad ⑩$$

where the variables $A(v)$, $B(v)$ and $C(v)$ mean a function of v. Looking at the K_0 system from the K_1 system as a different point of view (relativity in space), we get

$$\left.\begin{aligned} x_0 &= (x_1 + v \cdot t_1) \cdot A(-v), \\ t_0 &= (t_1 - B(-v) \cdot x_1) \cdot C(-v). \end{aligned}\right\}$$

Therefore, since these must hold true, we immediately obtain

$$\left.\begin{aligned} C(v) &= A(v), \\ B(v) &= \frac{A(v) \cdot A(-v) - 1}{v \cdot A(v) \cdot A(-v)}. \end{aligned}\right\} \qquad ⑪$$

All we need to do now is find $A(v)$, but in order to investigate the properties of this function, we focus on the origin of the K_1 system and put it together by substituting a formula $x_0 = v \cdot t_0$ and Equation ⑪ into the second equation of Equation ⑩, we get

$$\frac{t_1}{t_0} = \frac{1}{A(-v)}. \qquad ⑫$$

This shows the relationship between the time in the K_0 and the K_1 systems. Similarly, when the direction of motion of the K_1 system is reversed, it is held as

$$\frac{t_1}{t_0} = \frac{1}{A(v)}.$$

However, it is natural to think that this type of time relationship does not depend on the direction of the motion of the K_1 system (spatial symmetry). Therefore, it can be summarized as

$$A(v)=A(-v)=A>0. \quad ⑬$$

At this time, the sign of A was determined based on Equation ⑫: In other words, it is commonly said that the future corresponds to the future, and both t_0 and t_1 have the same sign. Substituting this Equation ⑬ into Equations ⑪ and ⑩, we get

$$B=B(v)=\frac{A^2-1}{v\cdot A^2},$$

$$x_1=(x_0-v\cdot t_0)\cdot A,\quad t_1=(t_0-B\cdot x_0)\cdot A.$$

Now, in order to make it easier to handle mathematically, we will represent the variables $x_1=x$ and $t_1=t$, and the ordinary differential with respect to v with dashes $(')$, and $a=A'/A-(A^2-1)/v$ is defined. Now, if we consider the identity where the right-hand side of Equation ⑧ is rewritten by Equation ⑦, the left-hand side is expressed by quantities only for the K_0 system , so of course it has nothing to do with v . Of course, it also holds true for v , so if we differentiate both sides with respect to v , we get

$$\left(\frac{\partial t}{\partial v}\right)\cdot\left(\frac{\partial G}{\partial t}\right)+\left(\frac{\partial x}{\partial v}\right)\cdot\left(\frac{\partial G}{\partial x}\right)=0,$$

and when we put it together, we get

$$\frac{\left(\dfrac{\partial G}{\partial t}\right)}{\left(\dfrac{\partial G}{\partial x}\right)}=\frac{A^2\cdot t-a\cdot x}{-a\cdot t-A^2B'\cdot x}.$$

The solution to this kind of differential equation is expressed as

$$G=h(A^2\cdot t^2-2a\cdot tx-A^2B'\cdot x^2),$$

where h is any one-dimensional function. However, since Equation ⑦ must be satisfied, it is true

$$a=0\quad\rightarrow\quad\frac{A'}{A}=\frac{(A^2-1)}{v},$$

and this solution can be easily obtained, and

$$\left|\frac{A^2-1}{v^2\cdot A^2}\right|=\text{const.}=\frac{1}{c^2},$$

$$\therefore\left|\frac{A^2-1}{A^2}\right|=\left(\frac{v}{c}\right)^2\equiv\beta^2, \quad ⑭$$

where c is a constant of integration (the universal velocity) that has the dimension of velocity.

From this, we will divide into three cases. First, when $A^2 = 1$, it corresponds to $c \to \infty$, and

$$F(t,x,y,z) = t, \tag{15}$$

when $A^2 > 1$, A is expressed as $A = 1/\sqrt{1-\beta^2}$, and

$$F(t,x,y,z) = c^2 \cdot t^2 - (x^2 + y^2 + z^2),$$

and when $A^2 < 1$, A is expressed as $A = 1/\sqrt{1+\beta^2}$, and

$$F(t,x,y,z) = c^2 \cdot t^2 + x^2 + y^2 + z^2.$$

Without the principle of the constancy of the velocity of light, the discussion cannot proceed any further.

d) Consideration

From the results in the previous section, the first thing that can be said is that Equation ⑭ does not use the principle of the constancy of the velocity of light; in other words, it can be obtained by using the fundamental properties of space and time in addition to the principle of relativity. According to Equation ⑭, there is a possibility that there is a velocity v that is always observed as a constant value for any inertial system. Given that Hattori's article also asserts this point, it is clearly inappropriate to describe it as an "alternative axiom" to the "principle of the constancy of the velocity of light." The "principle of the constancy of the velocity of light" is necessary for the subsequent expansion of Equation ⑭. By the way, if the velocity of light in vacuum is c_0, then the "principle of the constancy of the velocity of light" can be formulated as

$$c = c_0.$$

This immediately eliminates the Galilean transformation of Equation ⑮.

e) End Note

I tried to develop one aspect of the PTR in the form of an article, using the very recent debate as an issue. Criticizing the style of debate seems to be imposing one's personal preferences, but emotional debates in various academic journals only leave an ugly impression. It seems that the manner in which debates are held expresses the specific characteristics of an academic journal and, by extension, that academic society. In order to prevent this from becoming an argument for the sake of argument, I wanted to help science university students deepen their understanding of the PTR through discussion with their teachers.

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IV. Consideration of "Spatial Distortion"

a) The Origin of "Spatial Distortion"

Originally, the "spatial distortion" was proposed by Dr Einstein, but the fact that the "spatial distortion" does not exist can only be explained logically;

When the x-axes of the stationary and inertial systems overlap and the y-axes of both are parallel to each other, consider the x-coordinate of a point on the y-axis of the inertial system. At this time, if there is a gravity source on the x-axis, the space will be distorted, so there is a possibility that the x-coordinate of a point on the y-axis of the inertial system will vary depending on the value of the y-coordinate. René Descartes once founded the "analytical geometry," which is the study of geometry through algebraic calculations, representing the positions of points using coordinates. In other words, according to this, the distance from a point on the y-axis of the inertial system to the y-axis of the stationary system defines the x-coordinate of that point, so the x-coordinate is unrelated to the "spatial distortion." Therefore, as long as the coordinates of a point are expressed in Cartesian coordinates, the "spatial distortion" cannot be expressed. In short, the "spatial distortion" does not exist in principle.

On the other hand, there are materials that can determine the presence or absence of the "spatial distortion";

Now, in the pair of the stationary system (subscript "0") and the inertial system (subscript "1") treated above, the principle of relativity is expressed by Equation ⑤, but under the condition of $y_0 = y_1$ and $z_0 = z_1$, it is true

$$F(t_0, x_0, y_0, z_0) \equiv F(t_1, x_1, y_0, z_0). \quad ⑯$$

In fact, this formula is the only material that can be used to determine the presence or absence of the "spatial distortion." In other words, there are two cases; [Skew]=[As a result, identity ⑯ explicitly includes y_0 and z_0], or [Flat]=[As a result, identity ⑯ does not include y_0 and z_0]. In other words, the fact that the coordinate x_1 depends on y_0 and z_0, as in the apparent Equation ⑯, is [Skew], and is a case where the "spatial distortion" exists. Conversely, if the coordinate x_1 does not depend on y_0 or z_0, there is no distortion, and there is no "spatial distortion." In the history of physics, there is no evidence that anyone has dealt with [Skew].

As is already clear, even if the "spatial distortion" exists, it will not logically appear in "coordinates." Therefore, in order to express the "spatial distortion," the length of the space along the distortion or a physical quantity that can replace it is required. Nevertheless, Dr Einstein did not try to find such physical quantities, and although he said that the "spatial distortion" cannot be expressed by a formula, but as a formula that took into account the "spatial distortion" he produced Equation (18) of the advance of the planetary perihelion (hereinafter, the formula numbers in parentheses correspond to the formula numbers in the reference literature[1)]).

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b) A Study on "Spatial Distortion"

Here, as an example of analyzing the "spatial distortion", let's consider generalizing Equation ⑥;

$$F(t,x,y,z) = P(t) + Q(x) + Q(y) + Q(z) + R(tx) + R(ty) + R(tz)$$
$$+S(t^2x) + S(t^2y) + S(t^2z) + T(xy) + T(yz) + T(zx) + \cdots\cdots.$$

There are countless possible general functions. Therefore, we will limit ourselves to dealing with the cases from the first function P to the function R in this equation as a representative example that can be considered innumerably. Then, since the principle of relativity is given by the Equation ⑤, it is expressed as

$$P(t_0)+Q(x_0)+Q(y_0)+Q(z_0)+R(t_0\cdot x_0)+R(t_0\cdot y_0)+R(t_0\cdot z_0)\equiv$$
$$P(t_1)+Q(x_1)+Q(y_1)+Q(z_1)+R(t_1\cdot x_1)+R(t_1\cdot y_1)+R(t_1\cdot z_1).$$

Applying this formula to Equation ⑯, we get

$$P(t_0)+Q(x_0)+R(t_0\cdot x_0)+R(t_0\cdot y_0)+R(t_0\cdot z_0)\equiv$$
$$P(t_1)+Q(x_1)+R(t_1\cdot x_1)+R(t_1\cdot y_0)+R(t_1\cdot z_0).$$

This is the topic of [Skew] when I explained the previous Equation ⑯. Therefore, the only conditions where the "spatial distortion" does not exist are $R(tx)\equiv 0$, $R(ty)\equiv 0$ and $R(tz)\equiv 0$.

This result is utilized as an important basis for deriving hidden differential equations.

V. Content Rationale for the Preceding Article[1)]

a) Momentum of Particle and Light Quantum

From quantum mechanics, $E = h\nu$, and from the PTR,

$$E = m^* c^2. \;\rightarrow\; m^* = \frac{E}{c^2}, \tag{9}$$

For a Particle;

$$\boxed{\begin{array}{l} m^* = \dfrac{m}{\eta},\ \eta = \sqrt{1-\dfrac{v^2}{c^2}},\ v = c\cdot\sqrt{1-\eta^2}, \quad \rightarrow \quad m^*v = \dfrac{E}{c}\cdot\sqrt{1-\eta^2}, \\ \left(\dfrac{E}{c}\right)^2 - p^2 = m^2\cdot c^2, \quad \rightarrow \quad p = \sqrt{\left(\dfrac{E}{c}\right)^2 - m^2\cdot c^2} = \dfrac{E}{c}\cdot\sqrt{1-\eta^2} = m^*v. \end{array}}$$

For a Light Quantum;

$$m^* = \frac{\delta m}{\delta\eta},\ \delta\eta = \sqrt{1-\frac{c_0^2}{c^2}},\ c_0 = c\cdot\sqrt{1-\delta\eta^2}, \quad \to \quad m^* c_0 = \frac{E}{c}\cdot\sqrt{1-\delta\eta^2},$$

$$\left(\frac{E}{c}\right)^2 - p^2 = \delta m^2\cdot c^2, \quad \to \quad p = \sqrt{\left(\frac{E}{c}\right)^2 - \delta m^2\cdot c^2} = \frac{E}{c}\cdot\sqrt{1-\delta\eta^2} = m^* c_0,$$

$$c_0 = \lambda\cdot\nu = \frac{h\nu}{hk} = \frac{E}{hk}, \quad \to \quad E = hk\cdot c_0,$$

$$\therefore\ p = m^* c_0 = \frac{E}{c^2}\cdot c_0 = \frac{hk\cdot c_0}{c^2}\cdot c_0 = hk\cdot\frac{c_0^2}{c^2} = hk\cdot(1-\delta\eta^2).$$

b) Motion Equation of Light Quantum (one-dimensional)

$$\frac{d}{dt}\left\{\left(\frac{\delta m}{\delta\eta}\right)\cdot\dot{x}\right\} = -G\frac{M\cdot\delta m}{x^2}, \quad \to \quad \frac{d}{dt}\left\{\left(\frac{\delta m}{\delta\eta}\right)\cdot c_0\right\} = -G\frac{M\cdot\delta m}{x^2},$$

$$\frac{d}{dt}\left(\frac{\delta m}{\delta\eta}\right) = -G\frac{M\cdot\delta m}{c\cdot x^2}, \quad \to \quad x = \sqrt{-G\frac{M\cdot\delta m}{c}\Big/\frac{d}{dt}\left(\frac{\delta m}{\delta\eta}\right)},$$

$$\dot{x} = c_0 = \frac{d}{dt}\left\{\sqrt{-G\frac{M\cdot\delta m}{c}\Big/\frac{d}{dt}\left(\frac{\delta m}{\delta\eta}\right)}\right\}, \quad \to \quad t+T = \sqrt{-G\frac{M\cdot\delta m}{c^3}\Big/\frac{d}{dt}\left(\frac{\delta m}{\delta\eta}\right)},$$

$$\frac{d}{dt}\left(\frac{\delta m}{\delta\eta}\right) = \frac{GM\cdot\delta m}{c^3}\cdot\frac{d}{dt}\left\{\frac{1}{(t+T)}\right\}, \tag{13}$$

$$\frac{d}{dt}\left(\frac{1}{\delta\eta}\right) = \frac{GM}{c^3}\cdot\frac{d}{dt}\left\{\frac{1}{(t+T)}\right\}, \quad \to \quad \frac{\delta\eta_0'}{\delta\eta_0^2} = \frac{GM}{c^3T^2}, \quad \to \quad \frac{\sqrt{\delta\eta_0'}}{\delta\eta_0} = \sqrt{\frac{GM}{c^3}}\cdot\frac{1}{T},$$

$$\left(\frac{1}{\delta\eta} - \frac{1}{\delta\eta_0}\right) = \frac{GM}{c^3}\cdot\left\{\frac{1}{(t+T)} - \frac{1}{T}\right\} = \frac{GM}{c^3}\cdot\frac{-t}{T(t+T)} = \sqrt{\frac{GM}{c^3}}\cdot\frac{\sqrt{\delta\eta_0'}}{\delta\eta_0}\cdot\frac{-t}{(t+T)},$$

$$\therefore\ \frac{\delta\eta_0}{\delta\eta} = 1 - \sqrt{\frac{GM\cdot\delta\eta_0'}{c^3}}\cdot\frac{t}{(t+T)},$$

c) Motion Equation of Particle (two-dimensional)

$$\left.\begin{aligned} \frac{d}{dt}\left\{\left(\frac{\dot{r}}{\eta}\right)\cdot\cos\theta - \left(\frac{r}{\eta}\right)\cdot\sin\theta\cdot\dot{\theta}\right\} &= -\frac{GM}{r^2}\cdot\cos\theta, \\ \frac{d}{dt}\left\{\left(\frac{\dot{r}}{\eta}\right)\cdot\sin\theta + \left(\frac{r}{\eta}\right)\cdot\cos\theta\cdot\dot{\theta}\right\} &= -\frac{GM}{r^2}\cdot\sin\theta, \end{aligned}\right\} \tag{15}$$

$$\therefore \frac{d}{dt}\left(\frac{\dot{r}}{\eta}\right)\cdot\cos\theta-\left(\frac{\dot{r}}{\eta}\right)\cdot\sin\theta\cdot\dot{\theta}-\frac{d}{dt}\left(\frac{r}{\eta}\right)\cdot\sin\theta\cdot\dot{\theta}$$

$$-\left(\frac{r}{\eta}\right)\cdot\cos\theta\cdot\dot{\theta}^2-\left(\frac{r}{\eta}\right)\cdot\sin\theta\cdot\ddot{\theta}=-\frac{GM}{r^2}\cdot\cos\theta,$$

$$\therefore \frac{d}{dt}\left(\frac{\dot{r}}{\eta}\right)\cdot\sin\theta+\left(\frac{\dot{r}}{\eta}\right)\cdot\cos\theta\cdot\dot{\theta}+\frac{d}{dt}\left(\frac{r}{\eta}\right)\cdot\cos\theta\cdot\dot{\theta}$$

$$-\left(\frac{r}{\eta}\right)\cdot\sin\theta\cdot\dot{\theta}^2+\left(\frac{r}{\eta}\right)\cdot\cos\theta\cdot\ddot{\theta}=-\frac{GM}{r^2}\cdot\sin\theta,$$

$\left(\frac{\dot{r}}{\eta}\right)\cdot\dot{\theta}+\frac{d}{dt}\left(\frac{r}{\eta}\right)\cdot\dot{\theta}+\left(\frac{r}{\eta}\right)\cdot\ddot{\theta}=0,$	$\frac{d}{dt}\left(\frac{\dot{r}}{\eta}\right)-\frac{r\cdot\dot{\theta}^2}{\eta}=-\frac{GM}{r^2},$
$\left(\frac{\dot{r}}{\eta}+(\frac{\dot{r}}{\eta}-\frac{r\cdot\eta'}{\eta^2})\right)\cdot\dot{\theta}+\left(\frac{r}{\eta}\right)\cdot\ddot{\theta}=0,$	$\frac{d}{dt}\left(\frac{\dot{r}}{\eta}\right)-\frac{\dot{\theta}}{Kr}=-\frac{GM}{r^2},$
$\left(2\dot{r}-\frac{r\cdot\eta'}{\eta}\right)\cdot\frac{1}{r}+\frac{\ddot{\theta}}{\dot{\theta}}=0,$	$\frac{d}{dt}\left(\frac{\dot{r}}{\eta}\right)-\frac{\eta}{K^2r^3}=-\frac{GM}{r^2},$
$\frac{2\dot{r}}{r}-\frac{\eta'}{\eta}+\frac{\ddot{\theta}}{\dot{\theta}}=0, \quad\rightarrow\quad \eta=Kr^2\dot{\theta},$	$\because \frac{r\cdot\dot{\theta}^2}{\eta}=\frac{\dot{\theta}}{Kr}=\frac{\eta}{K^2r^3},$

$$\left.\begin{aligned}&\dot{r}^2+r^2\dot{\theta}^2=v^2=c^2\cdot(1-\eta^2),\\&1-\eta^2=\frac{\dot{r}^2}{c^2}+\frac{r^2}{c^2}\cdot\left(\frac{\eta}{Kr^2}\right)^2=\frac{\dot{r}^2}{c^2}+\frac{\eta^2}{c^2K^2r^2},\end{aligned}\right\}\quad\rightarrow\quad \eta^2=\frac{\left(1-\frac{\dot{r}^2}{c^2}\right)}{\left(1+\frac{1}{c^2K^2r^2}\right)},$$

$$\left.\begin{aligned}&p=1-\frac{\dot{r}^2}{c^2}, &&\rightarrow\quad p'=-\frac{2\dot{r}\ddot{r}}{c^2},\\&q=1+\frac{1}{c^2K^2r^2}, &&\rightarrow\quad q'=-\frac{2\dot{r}}{c^2K^2r^3},\end{aligned}\right\}\quad\rightarrow\quad \eta=\sqrt{\frac{p}{q}}=\frac{\sqrt{p}}{\sqrt{q}},$$

$$\text{Left side}=\frac{d}{dt}\left(\frac{\dot{r}}{\eta}\right)-\frac{\eta}{K^2r^3}=\frac{d}{dt}\left(\frac{\dot{r}\cdot\sqrt{q}}{\sqrt{p}}\right)-\frac{\eta}{K^2r^3},$$

$$=\frac{\ddot{r}\cdot\sqrt{q}}{\sqrt{p}}+\frac{\dot{r}\cdot q'}{2\sqrt{p}\cdot\sqrt{q}}-\frac{\dot{r}\cdot\sqrt{q}\cdot p'}{2\sqrt{p^3}}-\frac{\eta}{K^2r^3},$$

$$=\frac{\ddot{r}\cdot\sqrt{q}}{\sqrt{p}}-\frac{\dot{r}^2}{c^2K^2r^3\cdot\sqrt{pq}}+\frac{\dot{r}^2\cdot\ddot{r}\sqrt{q}}{c^2\cdot\sqrt{p^3}}-\frac{\sqrt{p}}{K^2r^3\cdot\sqrt{q}},$$

$$=\frac{\ddot{r}\cdot\sqrt{q}}{\sqrt{p^3}}\cdot\left(p+\frac{\dot{r}^2}{c^2}\right)-\frac{1}{K^2r^3\cdot\sqrt{pq}}\cdot\left(\frac{\dot{r}^2}{c^2}+p\right),$$

$$= \frac{\ddot{r} \cdot \sqrt{q}}{\sqrt{p^3}} - \frac{1}{K^2 r^3 \cdot \sqrt{pq}} = \frac{\sqrt{q}}{\sqrt{p^3}} \cdot \left(\ddot{r} - \frac{\sqrt{p^3}}{K^2 r^3 \cdot \sqrt{pq} \cdot \sqrt{q}} \right),$$

$$= \frac{\sqrt{q}}{\sqrt{p^3}} \cdot \left(\ddot{r} - \frac{p}{K^2 r^3 \cdot q} \right) = \frac{\sqrt{q}}{\sqrt{p^3}} \cdot \left(\ddot{r} - \frac{\eta^2}{K^2 r^3} \right) = \frac{\sqrt{q}}{\sqrt{p^3}} \cdot (\ddot{r} - r \cdot \dot{\theta}^2),$$

$$\therefore \ddot{r} - r \cdot \dot{\theta}^2 = -\frac{GM}{r^2} \cdot \frac{\sqrt{p^3}}{\sqrt{q}} = -\frac{GM}{r^2} \cdot \sqrt{\left(1 - \frac{\dot{r}^2}{c^2}\right)^3 \Big/ \left(1 + \frac{1}{c^2 K^2 r^2}\right)}, \tag{16}$$

d) Advance of Planetary Perihelion

Newtonian Mechanics;

$$r = \frac{\pm a(1-e^2)}{(1 + e \cdot \cos\theta)}, \qquad R = \pm a(1-e), \quad ; \quad \text{Distance of Perihelion}(>0)$$

$$\frac{R(1+e)}{r} = 1 + e \cdot \cos\theta, \qquad K r^2 \dot{\theta} = 1,$$

$$-\frac{R(1+e)}{r^2} \cdot \dot{r} = -e \cdot \sin\theta \cdot \dot{\theta}, \quad \rightarrow \quad KR(1+e)\dot{r} = e \cdot \sin\theta,$$

$$KR(1+e)\ddot{r} = e \cdot \cos\theta \cdot \dot{\theta} = \left\{ \frac{R(1+e)}{r} - 1 \right\} \cdot \dot{\theta}, \quad \rightarrow \quad KR(1+e)\left(\ddot{r} - \frac{\dot{\theta}}{Kr} \right) = -\dot{\theta},$$

$$\ddot{r} - r\dot{\theta}^2 = -\frac{\dot{\theta}}{KR(1+e)} \qquad = -\frac{GM}{r^2}, \quad \rightarrow \quad \sqrt{R(1+e)GM} = r^2 \dot{\theta} = \frac{1}{K},$$

$$\ddot{r} - r\dot{\theta}^2 = -\frac{GM}{r^2} \cdot \sqrt{\left(1 - \frac{\dot{r}^2}{c^2}\right)^3 \Big/ \left(1 + \frac{1}{c^2 K^2 r^2}\right)}, \tag{16}$$

$$\ddot{r} - r\dot{\theta}^2 \approx -\frac{GM}{r^2} \cdot \left(1 - \frac{3\dot{r}^2}{2c^2}\right) \cdot \left(1 - \frac{1}{2c^2 K^2 r^2}\right) \approx -\frac{GM}{r^2} + \frac{3GM}{2c^2} \cdot \frac{\dot{r}^2}{r^2} + \frac{GM}{2c^2 K^2} \cdot \frac{1}{r^4},$$

$$\therefore \frac{-\dot{\theta}}{KR(1+e)} = \frac{3GM}{2c^2} \cdot < \frac{\dot{r}^2}{r^2} > + \frac{GM}{2c^2 K^2} \cdot < \frac{1}{r^4} >,$$

$$= \frac{3GM}{2c^2 K^2 R^4 (1+e)^4} \cdot < e^2 \cdot \sin^2\theta \cdot (1 + e \cdot \cos\theta)^2 >$$

$$+ \frac{GM}{2c^2 K^2 R^4 (1+e)^4} \cdot < (1 + e \cdot \cos\theta)^4 >,$$

$$= \frac{GM}{2c^2 K^2 R^4 (1+e)^4} \cdot < 3e^2 \cdot \sin^2\theta \cdot (1 + e \cdot \cos\theta)^2 + (1 + e \cdot \cos\theta)^4 >,$$

$$< 3e^2 \cdot \sin^2\theta \cdot (1+e\cdot\cos\theta)^2 + (1+e\cdot\cos\theta)^4 >$$

$$=< 3e^2 \cdot \sin^2\theta \cdot (1+e^2\cdot\cos^2\theta) + (1+6e^2\cdot\cos^2\theta + e^4\cdot\cos^4\theta) >,$$

$$=< 3e^2 \cdot (\tfrac{1}{2} + \tfrac{e^2}{4}\cdot\tfrac{1}{2}) + \{1+3e^2+\tfrac{e^4}{4}\cdot(1+\cos 2\theta)^2\} >,$$

$$= \tfrac{3}{2}e^2 + \tfrac{3}{8}e^4 + 1 + 3e^2 + \tfrac{e^4}{4}\cdot(1+\tfrac{1}{2}),$$

$$= 1 + \tfrac{9}{2}\cdot e^2 + \tfrac{3}{4}\cdot e^4,$$

$$\frac{-\dot\theta}{KR(1+e)} = \frac{GM\cdot(1+\frac{9}{2}\cdot e^2+\frac{3}{4}\cdot e^4)}{2c^2K^2\cdot R^4(1+e)^4},$$

$$\therefore -\dot\theta = \frac{GM\cdot(1+\frac{9}{2}\cdot e^2+\frac{3}{4}\cdot e^4)}{2c^2K\cdot R^3(1+e)^3} = \frac{(GM)^{3/2}\cdot(1+\frac{9}{2}\cdot e^2+\frac{3}{4}\cdot e^4)}{2c^2\cdot a^{5/2}\cdot(1-e^2)^{5/2}}, \tag{17}$$

e) Calculation Example of Advance of Planetary Perihelion

Let ω be the angular velocity of the planetary perihelion movement, and let the direction of an orbital rotation be positive. In line with the GTR, the advance of the planetary perihelion for every rotation (where T is an orbital period) gives the following:

$$\omega = \left(\frac{2\pi}{T}\right)\cdot\frac{3GM}{c^2a\cdot\sqrt{1-e^2}}. \tag{18}$$

On the other hand, in the PTR, the angular velocity gives

$$\omega = (-\dot\theta) = \frac{(GM)^{3/2}\cdot(1+\frac{9}{2}\cdot e^2+\frac{3}{4}\cdot e^4)}{2c^2\cdot a^{5/2}\cdot(1-e^2)^{5/2}}. \tag{17}$$

Examples of calculation of ω are shown in Table 1 for the three inner planets.

Table 1: Calculated Values of ω (a 100-year total)

Planet	GTR	PTR
Mercury	$42''.0610406$	$9''.106565107$
Venus	$8''.624605961$	$1''.43795977$
Earth	$3''.838082181$	$0''.640840427$

$\boxed{1}$ $c = 29.9792458 \times 10^{4+3} (\mathrm{m} / \mathrm{s}),$

$\boxed{2}$ $GM_s = 1.32712440041 \times 10^{20} (\mathrm{m}^3 / \mathrm{s}^2),$

$\boxed{3}$ $1(\mathrm{AU}) = 1.49597870700 \times 10^{11} (\mathrm{m}),$

$\boxed{4}$ $1(\mathrm{rad} / \mathrm{s}) = 6.509083065 \times 10^{14} (''/\mathrm{century}),$

$$= \left(\frac{180}{\pi} \times 3600 \right) \times (100 \times 365.24219 \times 24 \times 3600),$$

Table 2: Orbital Constants

	Mercury	Venus	Earth
$a(\mathrm{AU})$	0.3871	0.7233	1
$\boxed{5}$ $a(\mathrm{m})$	$5.790933575 \times 10^{10}$	$1.082041399 \times 10^{11}$	$1.49597870700 \times 10^{11}$
$\boxed{6}$ e	0.2056	0.0068	0.0167
$T(\mathrm{year})$	0.24085	0.61521	1.00004
$\boxed{7}$ $T(\mathrm{s})$	7.600485438×10^6	1.941413596×10^7	3.155818749×10^7

f) Equation of Motion of Light Quantum (two-dimensional)

$$\left.\begin{aligned} \frac{d}{dt}\left(\frac{\dot{r} \cdot \cos\theta - r \cdot \sin\theta \cdot \dot{\theta}}{\delta\eta} \right) &= -\frac{GM}{r^2} \cdot \cos\theta, \\ \frac{d}{dt}\left(\frac{\dot{r} \cdot \sin\theta + r \cdot \cos\theta \cdot \dot{\theta}}{\delta\eta} \right) &= -\frac{GM}{r^2} \cdot \sin\theta, \end{aligned}\right\} \tag{15}$$

$$\frac{d}{dt}\left(\frac{\dot{r}}{\delta\eta} \right) \cdot \cos\theta - \frac{\dot{r}}{\delta\eta} \cdot \sin\theta \cdot \dot{\theta} - \frac{d}{dt}\left(\frac{r}{\delta\eta} \right) \cdot \sin\theta \cdot \dot{\theta}$$

$$-\frac{r}{\delta\eta} \cdot \cos\theta \cdot \dot{\theta}^2 - \frac{r}{\delta\eta} \cdot \sin\theta \cdot \ddot{\theta} = -\frac{GM}{r^2} \cdot \cos\theta,$$

$$\frac{d}{dt}\left(\frac{\dot{r}}{\delta\eta} \right) \cdot \sin\theta + \frac{\dot{r}}{\delta\eta} \cdot \cos\theta \cdot \dot{\theta} + \frac{d}{dt}\left(\frac{r}{\delta\eta} \right) \cdot \cos\theta \cdot \dot{\theta}$$

$$-\frac{r}{\delta\eta} \cdot \sin\theta \cdot \dot{\theta}^2 + \frac{r}{\delta\eta} \cdot \cos\theta \cdot \ddot{\theta} = -\frac{GM}{r^2} \cdot \sin\theta,$$

$$\frac{\dot{r}}{\delta\eta}\cdot\dot{\theta}+\frac{d}{dt}\left(\frac{r}{\delta\eta}\right)\cdot\dot{\theta}+\frac{r}{\delta\eta}\cdot\ddot{\theta}=0,$$

$$\left(\frac{\dot{r}}{\delta\eta}+\left(\frac{\dot{r}}{\delta\eta}-\frac{r\cdot\delta\eta'}{\delta\eta^{2}}\right)\right)\cdot\dot{\theta}+\frac{r}{\delta\eta}\cdot\ddot{\theta}=0,$$

$$\left(2\dot{r}-\frac{r\cdot\delta\eta'}{\delta\eta}\right)\cdot\frac{1}{r}+\frac{\ddot{\theta}}{\dot{\theta}}=0,$$

$$\therefore\frac{2\dot{r}}{r}-\frac{\delta\eta'}{\delta\eta}+\frac{\ddot{\theta}}{\dot{\theta}}=0,\quad\rightarrow\quad\delta\eta=Kr^{2}\dot{\theta},$$

$$\frac{d}{dt}\left(\frac{\dot{r}}{\delta\eta}\right)-\frac{r}{\delta\eta}\cdot\dot{\theta}^{2}=-\frac{GM}{r^{2}},$$

$$\frac{d}{dt}\left(\frac{\dot{r}}{\delta\eta}\right)-\frac{\dot{\theta}}{Kr}=-\frac{GM}{r^{2}},$$

$$\frac{d}{dt}\left(\frac{\dot{r}}{\delta\eta}\right)-\frac{\delta\eta}{K^{2}r^{3}}=-\frac{GM}{r^{2}},$$

$$\because\frac{r}{\delta\eta}\cdot\dot{\theta}^{2}=\frac{\dot{\theta}}{Kr}=\frac{\delta\eta}{K^{2}r^{3}},$$

$$\left.\begin{aligned}&\dot{r}^{2}+r^{2}\dot{\theta}^{2}=c_{0}^{2}=c^{2}\cdot(1-\delta\eta^{2}),\\&1-\delta\eta^{2}=\frac{\dot{r}^{2}}{c^{2}}+\frac{r^{2}}{c^{2}}\cdot\left(\frac{\delta\eta}{Kr^{2}}\right)^{2}=\frac{\dot{r}^{2}}{c^{2}}+\frac{\delta\eta^{2}}{c^{2}K^{2}r^{2}},\end{aligned}\right\}\quad\rightarrow\quad\delta\eta^{2}=\frac{\left(1-\frac{\dot{r}^{2}}{c^{2}}\right)}{\left(1+\frac{1}{c^{2}K^{2}r^{2}}\right)},$$

$$\left.\begin{aligned}&p=1-\frac{\dot{r}^{2}}{c^{2}}, && p'=-\frac{2\dot{r}\ddot{r}}{c^{2}},\\&q=1+\frac{1}{c^{2}K^{2}r^{2}}, && q'=-\frac{2\dot{r}}{c^{2}K^{2}r^{3}},\end{aligned}\right\}\quad\rightarrow\quad\delta\eta=\sqrt{\frac{p}{q}}=\frac{\sqrt{p}}{\sqrt{q}},$$

Left side $=\frac{d}{dt}\left(\frac{\dot{r}}{\delta\eta}\right)-\frac{\delta\eta}{K^{2}r^{3}}=\frac{d}{dt}\left(\frac{\dot{r}\sqrt{q}}{\sqrt{p}}\right)-\frac{\delta\eta}{K^{2}r^{3}},$

$$=\left(\frac{\ddot{r}\sqrt{q}}{\sqrt{p}}+\frac{\dot{r}q'}{2\sqrt{p}\cdot\sqrt{q}}-\frac{\dot{r}\sqrt{q}}{2\sqrt{p^{3}}}\cdot p'\right)-\frac{\delta\eta}{K^{2}r^{3}},$$

$$=\frac{\ddot{r}\sqrt{q}}{\sqrt{p}}-\frac{\dot{r}^{2}}{c^{2}K^{2}r^{3}\cdot\sqrt{pq}}+\frac{\dot{r}^{2}\ddot{r}\sqrt{q}}{c^{2}\sqrt{p^{3}}}-\frac{\sqrt{p}}{K^{2}r^{3}\cdot\sqrt{q}},$$

$$=\frac{\ddot{r}\sqrt{q}}{\sqrt{p^{3}}}\cdot\left(p+\frac{\dot{r}^{2}}{c^{2}}\right)-\frac{1}{K^{2}r^{3}\cdot\sqrt{pq}}\cdot\left(\frac{\dot{r}^{2}}{c^{2}}+p\right),$$

$$=\frac{\ddot{r}\sqrt{q}}{\sqrt{p^{3}}}-\frac{1}{K^{2}r^{3}\cdot\sqrt{pq}}=\frac{\sqrt{q}}{\sqrt{p^{3}}}\cdot\left(\ddot{r}-\frac{\sqrt{p^{3}}}{K^{2}r^{3}\cdot\sqrt{pq}\cdot\sqrt{q}}\right),$$

$$=\frac{\sqrt{q}}{\sqrt{p^{3}}}\cdot\left(\ddot{r}-\frac{p}{K^{2}r^{3}q}\right)=\frac{\sqrt{q}}{\sqrt{p^{3}}}\cdot\left(\ddot{r}-\frac{\delta\eta^{2}}{K^{2}r^{3}}\right)=\frac{\sqrt{q}}{\sqrt{p^{3}}}\cdot(\ddot{r}-r\dot{\theta}^{2}),$$

$$\therefore\ddot{r}-r\dot{\theta}^{2}=-\frac{GM}{r^{2}}\cdot\left[\!\left[\frac{\sqrt{p^{3}}}{\sqrt{q}},\ \delta\eta^{3}\cdot q,\ \delta\eta\cdot p,\ \delta\eta^{n}\right]\!\right],\qquad(16),(19)$$

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g) Consideration

Since Dr Einstein could not escape from the principle of the constancy of the velocity of light, he had no choice but to always make the mass of a light quantum zero. However, since light quantum exist within the solar system (in a gravitational field), it is abnormal in physics that the equation of motion for light quantum cannot be expressed. In reality, the equation of motion of Equation (19) holds true only for light quantum that have a near universal velocity.

On the other hand, planets have large masses, so it is puzzling that Dr Einstein did not discuss the equation of motion of planets. In other words, he did not solve the differential equation (15), which is an extension of Newtonian mechanics. For this reason, he was unable to obtain the subsequent equation of motion of the planet (16) and the exact solution to the advance of the planetary perihelion (17). Instead, Dr Einstein constructed a new GTR that incorporates "spatial distortion." In other words, they interpreted that the reason why advance of Mercury's perihelion exceeded the value predicted by Newtonian mechanics was that space was distorted by the Sun's strong gravity. As a result, he derived Equation (18) for the advance of the planetary perihelion according to the GTR.

The GTR does not explain the value of the advance of the planetary perihelion. The problem is that the GTR does not meet the necessary conditions. This is because the observed value of the advance of the planetary perihelion, minus the predicted value of Newtonian mechanics, is expressed as the product of the calculated value of Equation (18) and the planet's orbital eccentricity (reference to Table 1 in the preceding article[1)]). Dr Einstein never explained the situation involving orbital eccentricity.

In contrast, the PTR has proven that the necessary conditions are met for the most famous observation of the advance of the Mercury's perihelion in the history of physics. That is, Equation (17) is a correct equation, and Equation (18) is a meaningless equation. Therefore, it has been proven once again that the "spatial distortion" does not exist and that the GTR is meaningless in terms of physics.

VI. End Note

What is noteworthy is that physics has reached a qualitatively completely new stage. In other words, the universal velocity as a physical constant is expressed by one limit value (Equation (11) of the preceding article[1)]). In other words, there are physical constants that can never be obtained from experiments.

In the history of physics, the "Riemannian geometry" was adopted when the "spatial distortion" was discussed. In other words, this means abandoning the "Euclidean geometry" and is unacceptable in terms of physics.

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Color of Flavor of Leptons

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Abstract- This paper suggests the possible existence of lepton color $(l_{\mathrm{R}}, l_{\mathrm{G}}, l_{\mathrm{B}}), l_{\mathrm{RGB}}$ for charged leptons and neutral leptons as quarks possess $(q_{\mathrm{R}}, q_{\mathrm{G}}, q_{\mathrm{B}}), q_{\mathrm{RGB}}$. Further lepton number conservation could be explained by lepton color scalar products. More details are given to search for the relationship between the broken lepton number and PMNS. And a speculation between broken lepton number and dark matter-energy.

Keywords: *flovor similarity, color similarity, lepton number conservation, Pontecorvo-Maki-Nakagawa-Sakata Matrix PMNS, leptoncolor scalar product, leptoncolor brokenon* $\vec{n}_{\beta}$, *neutrino lepton number* $\mathrm{L}(\upsilon^{\dagger}\acute{\upsilon})$, *broken neutrino lepton number* $\mathrm{L}_{\mathrm{Broken}}(\upsilon)$, *neutrino mass lepton number* $\mathrm{L}_{\mathrm{Mass}}(\upsilon)$, *neutrino lepton coupling constant* $\mathrm{G}_{L}(\upsilon)$, *neutrino background lepton number* $\mathrm{L}_{\mathrm{Background}}(\upsilon)$, *dark matter-energy* $E_{\mathrm{DME}}(\upsilon)$.

GJSFR-A Classification: *LCC: QC793.5.E62*

COLOROFFLAVOROFLEPTONS

Strictly as per the compliance and regulations of:

Color of Flavor of Leptons

ShaoXu Ren

Abstraction-

This paper suggests the possible existence of lepton color $(l_{\mathrm{R}}, l_{\mathrm{G}}, l_{\mathrm{B}}), l_{\mathrm{RGB}}$ for charged leptons and neutral leptons as quarks possess $(q_{\mathrm{R}}, q_{\mathrm{G}}, q_{\mathrm{B}}), q_{\mathrm{RGB}}$. Further lepton number conservation could be explained by *leptoncolor scalar products.* More details are given to search for the relationship between the broken lepton number and PMNS. And a speculation between broken lepton number and dark matter-energy.

Keywords: flavor similarity, color similarity, lepton number conservation, Pontecorvo-Maki-Nakagawa-Sakata Matrix PMNS, leptoncolor scalar product, leptoncolor brokenon $\vec{n}_{\beta}$, neutrino lepton number $\mathrm{L}(\upsilon^{\dagger\prime}\upsilon^{\prime})$, broken neutrino lepton number $\mathrm{L}_{\mathrm{Broken}}(\upsilon)$, neutrino mass lepton number $\mathrm{L}_{\mathrm{Mass}}(\upsilon)$, neutrino lepton coupling constant $\mathrm{G}_{L}(\upsilon)$, neutrino background lepton number $\mathrm{L}_{\mathrm{Background}}(\upsilon)$, dark matter-energy $E_{\mathrm{DME}}(\upsilon)$

Contents

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0. Introduction

- In particle physics, six leptons and six antileptons are labelled by a group of unified three symbols L_e, L_μ, L_τ (00.1), which are their identity quantum numbers in particle community.

$$L_e, \quad L_\mu, \quad L_\tau \tag{00.1}$$

The values of $L_e, L_\mu,$ *and* L_τ are illustrated in Table1 below, in which there are all together 36 positions filled with integers $+1$, -1 and zero.

Experimental scientists discovery: $L_e, L_\mu,$ and L_τ are conserved separately in weak interactions for leptons and their antileptons. expecialty the sum L= $L_e + L_\mu + L_\tau$ are conserved too, which are along with the horizontal direction in Table1 [1]

Theoretical scientists wonder: Is there an unified math approach which could explain *Where The values, integers $+1$, -1 and zero, of* L_e, L_μ, L_τ of leptons and of antileptons, that appear in Table1, *come from ?*

- The experimental searchers for neutrino oscilations, they obtain Pontecorvo-Maki-Nakagawa-Sakata Matrix, PMNS $(V_L^e)^\dagger V_L^\nu$ [2], which is the extremely pecfect achievement from their spirits of awe and adventure. long time persistent effor in analysing the data collected from weak interaction. There are many profound digits appear in the nine elements of PMNS that given in Matrix(1) and Matrix(2) below.

Theoretical searchers wonder: the origin of these mysterious digits, that occupy the elements of these matrices, *where the odd digit arrangements come from ?*

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Table 1: The values of lepton numbers

Particle	Lepton number L	$\Vert$	Electron Lepton number L_e	Muon Lepton number L_μ	Tau Lepton number L_τ
υ_e	$+1$	$\vert$	$+1$	0	0
e^-	$+1$	$\vert$	$+1$	0	0
υ_μ	$+1$	$\vert$	0	$+1$	0
μ^-	$+1$	$\vert$	0	$+1$	0
υ_τ	$+1$	$\vert$	0	0	$+1$
τ^-	$+1$	$\vert$	0	0	$+1$
$\bar{\upsilon}_e$	-1	$\vert$	-1	0	0
e^+	-1	$\vert$	-1	0	0
$\bar{\upsilon}_\mu$	-1	$\vert$	0	-1	0
μ^+	-1	$\vert$	0	-1	0
$\bar{\upsilon}_\tau$	-1	$\vert$	0	0	-1
τ^+	-1	$\vert$	0	0	-1
Anti Particle	Lepton number L	$\Vert$	Electron Lepton number L_e	Muon Lepton number L_μ	Tau Lepton number L_τ

- $$|U^{PMNS}| = \begin{pmatrix} 0.797 \rightarrow 0.842 & 0.518 \rightarrow 0.585 & 0.143 \rightarrow 0.156 \\ 0.243 \rightarrow 0.490 & 0.473 \rightarrow 0.674 & 0.651 \rightarrow 0.772 \\ 0.295 \rightarrow 0.525 & 0.493 \rightarrow 0.688 & 0.618 \rightarrow 0.744 \end{pmatrix}$$

Matrix(1)

" The U^{PMNS} looks very different from that of CKM, which is very diagonal. The leptonic sector is characterized by a very lare degree of mixing. As of today, the origin of this pattern remains an unsolved and profound puzzle! ". André Rubbia [3]

And

- $$|V_{\text{PMES}}| = \begin{pmatrix} 0.801 - 0.845 & 0.513 - 0.579 & 0.143 - 0.155 \\ 0.234 - 0.500 & 0.471 - 0.689 & 0.637 - 0.776 \\ 0.271 - 0.525 & 0.477 - 0.694 & 0.613 - 0.756 \end{pmatrix}$$

Matrix(2)

" As of today, assuming the unitary of the matrix and three active neutrinos, the absolute values of the elements of the matrix are estimated from a global fit of all measurements, which gives (Esteban et al., 2020) " PASCAL PAGANINI [4]

And

- $$U_{\text{PMNS}} = \begin{pmatrix} \bullet & \bullet & \cdot \\ \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \end{pmatrix} = (V_{\text{CKM}}) \cdot P, \quad P = \text{diag}\left(e^{\frac{i\alpha_1}{2}}, e^{\frac{i\alpha_2}{2}}, 1\right); \qquad V_{\text{CKM}} = \begin{pmatrix} \bullet & \cdot & \cdot \\ \cdot & \bullet & \cdot \\ \cdot & \cdot & \bullet \end{pmatrix}$$

Matrix(3) Matrix(0)

The magnitudes of the element digits of PMNS in Matrix(1) and Matrix(2) could be graphical approached by the circle areas in Matrix(3) qualitatively above [5]. Andrzel J. Buras：

" The explanation of these patterns and in particular why they differ from each other remains an important goal of the theorists. " and " Why the mixing angles of CKM matrix so small and those of PMNS matrix rather large? "

1. Color of Flavor of Leptons

This paper attempts to explore and answer the above two " *come from ?* " questions. So two concepts of • *Color Similarity* and • *lepton color* are introduced following

Current particle physics shows an amazing *Flovor Similarity* between three generations of quark and those of leptons below

$$\text{six quarks} \begin{pmatrix} u \\ d \end{pmatrix}, \begin{pmatrix} c \\ s \end{pmatrix}, \begin{pmatrix} t \\ b \end{pmatrix} \quad \Leftrightarrow \quad \text{six leptons} \begin{pmatrix} \upsilon_e \\ e^- \end{pmatrix}, \begin{pmatrix} \upsilon_\mu \\ \mu^- \end{pmatrix}, \begin{pmatrix} \upsilon_\tau \\ \tau^- \end{pmatrix} \tag{0.00}$$

$$\text{as well antiquarks} \begin{pmatrix} \bar{u} \\ \bar{d} \end{pmatrix}, \begin{pmatrix} \bar{c} \\ \bar{s} \end{pmatrix}, \begin{pmatrix} \bar{t} \\ \bar{b} \end{pmatrix} \quad \Leftrightarrow \quad \text{antileptons} \begin{pmatrix} \bar{\upsilon}_e \\ e^+ \end{pmatrix}, \begin{pmatrix} \bar{\upsilon}_\mu \\ \mu^+ \end{pmatrix}, \begin{pmatrix} \bar{\upsilon}_\tau \\ \tau^+ \end{pmatrix} \tag{0.00}$$

Since six quarks and six antiquarks have been unified by means of " fundamental color representation of six flavor t, c, u, d, s, b of quarks and their six antiquarks " [6,7,8,9,10], And in this idea, why not continues to have a try to do the six flavor $\upsilon_\tau, \upsilon_\mu, \upsilon_e, e^-, \mu^-, \tau^-$ of leptons and the six antileptons ? That is, besides *Flovor Similarity* (0.00), there may be

$$\bullet \quad \textit{Color Similarity} \qquad \text{quark } (q_{\mathrm{R}}, q_{\mathrm{G}}, q_{\mathrm{B}}), q_{\mathrm{RGB}} \quad \Leftrightarrow \quad \text{lepton } (l_{\mathrm{R}}, l_{\mathrm{G}}, l_{\mathrm{B}}), l_{\mathrm{RGB}} \tag{$\widetilde{0.00}$}$$

Base on $(\widetilde{0.00})$, This paper postulates an **ansatz**, If *the six fermion leptons & their antileptons* (0.00) *also are attributed to color degree of freedom as* six fermion quarks & their antiquarks were done in Stand Model historically, and then the third component $I_3(l)$ isospin of a lepton l could be written by • *lepton color* l_{RGB}, $(l_{\mathrm{R}}, l_{\mathrm{G}}, l_{\mathrm{B}})$ as below

$$I_3(l) \;=\; \frac{1}{3}(l_{\mathrm{R}} + l_{\mathrm{G}} + l_{\mathrm{B}}) \;\equiv\; I_3(l_{\mathrm{RGB}}) \tag{0.0}$$

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Or details

$$\vec{u} = (u_{\mathrm{R}}, u_{\mathrm{G}}, u_{\mathrm{B}}) \Rightarrow \vec{\upsilon}_e = (\upsilon_{e\mathrm{R}}, \upsilon_{e\mathrm{G}}, \upsilon_{e\mathrm{B}}) = (\tfrac{-1}{2}, \tfrac{+1}{2}, \tfrac{+3}{2}), \qquad I_3(\upsilon_e) = \tfrac{1}{3}(\tfrac{-1}{2} + \tfrac{+1}{2} + \tfrac{+3}{2}) = \tfrac{+1}{2} \tag{0.1}$$

$$\vec{d} = (d_{\mathrm{R}}, d_{\mathrm{G}}, d_{\mathrm{B}}) \Rightarrow \vec{e^-} = (e_{\bar{\mathrm{R}}}, e_{\bar{\mathrm{G}}}, e_{\bar{\mathrm{B}}}) = (\tfrac{-3}{2}, \tfrac{-1}{2}, \tfrac{+1}{2}), \qquad I_3(e^-) = \tfrac{1}{3}(\tfrac{-3}{2}, \tfrac{-1}{2}, \tfrac{+1}{2}) = \tfrac{-1}{2} \tag{0.2}$$

$$\vec{c} = (c_{\mathrm{R}}, c_{\mathrm{G}}, c_{\mathrm{B}}) \Rightarrow \vec{\upsilon}_\mu = (\upsilon_{\mu\mathrm{R}}, \upsilon_{\mu\mathrm{G}}, \upsilon_{\mu\mathrm{B}}) = (\tfrac{+1}{2}, \tfrac{+3}{2}, \tfrac{+5}{2}), \qquad I_3(\upsilon_\mu) = \tfrac{1}{3}(\tfrac{+1}{2}, \tfrac{+3}{2}, \tfrac{+5}{2}) = \tfrac{+3}{2} \tag{0.3}$$

$$\vec{s} = (s_{\mathrm{R}}, s_{\mathrm{G}}, s_{\mathrm{B}}) \Rightarrow \vec{\mu^-} = (\mu_{\bar{\mathrm{R}}}, \mu_{\bar{\mathrm{G}}}, \mu_{\bar{\mathrm{B}}}) = (\tfrac{-5}{2}, \tfrac{-3}{2}, \tfrac{-1}{2}), \qquad I_3(\mu^-) = \tfrac{1}{3}(\tfrac{-5}{2} + \tfrac{-3}{2} + \tfrac{-1}{2}) = \tfrac{-3}{2} \tag{0.4}$$

$$\vec{t} = (t_{\mathrm{R}}, t_{\mathrm{G}}, t_{\mathrm{B}}) \Rightarrow \vec{\upsilon}_\tau = (\upsilon_{\tau\mathrm{R}}, \upsilon_{\tau\mathrm{G}}, \upsilon_{\tau\mathrm{B}}) = (\tfrac{+3}{2}, \tfrac{+5}{2}, \tfrac{+7}{2}), \qquad I_3(\upsilon_\tau) = \tfrac{1}{3}(\tfrac{+3}{2} + \tfrac{+5}{2} + \tfrac{+7}{2}) = \tfrac{+5}{2} \tag{0.5}$$

$$\vec{b} = (b_{\mathrm{R}}, b_{\mathrm{G}}, b_{\mathrm{B}}) \Rightarrow \vec{\tau^-} = (\tau_{\bar{\mathrm{R}}}, \tau_{\bar{\mathrm{G}}}, \tau_{\bar{\mathrm{B}}}) = (\tfrac{-7}{2}, \tfrac{-5}{2}, \tfrac{-3}{2}), \qquad I_3(\tau^-) = \tfrac{1}{3}(\tfrac{-7}{2} + \tfrac{-5}{2} + \tfrac{-3}{2}) = \tfrac{-5}{2} \tag{0.6}$$

Further we, very naturally, could obtain a universal color representation of leptons and antileptons below, which is the analogous to that of quarks [7]. And isospin $I_3(l_{\mathrm{RGB}})$ (0.0) is an underlying classfications of three generation of leptons.

Table 2: Fundamental Color Representation of flavor $\upsilon_\tau, \upsilon_\mu, \upsilon_e, e^-, \mu^-, \tau^-$ of leptonss and their antileptons

lepton flavor r	υ_τ	υ_μ	υ_e	e^-	μ^-	τ^-
$I_3(l_\alpha)$	$I_3(\upsilon_\tau)$ $\frac{+5}{2}$	$I_3(\upsilon_\mu)$ $\frac{+3}{2}$	$I_3(\upsilon_e)$ $\frac{+1}{2}$	$I_3(e^-)$ $\frac{-1}{2}$	$I_3(\mu^-)$ $\frac{-3}{2}$	$I_3(\tau^-)$ $\frac{-5}{2}$
l_α l_{RGB}	$\upsilon_{\tau R}$ $\frac{+3}{2}$, $\upsilon_{\tau G}$ $\frac{+5}{2}$, $\upsilon_{\tau B}$ $\frac{+7}{2}$	$\upsilon_{\mu R}$ $\frac{+1}{2}$, $\upsilon_{\mu G}$ $\frac{+3}{2}$, $\upsilon_{\mu B}$ $\frac{+5}{2}$	υ_{eR} $\frac{-1}{2}$, υ_{eG} $\frac{+1}{2}$, υ_{eB} $\frac{+3}{2}$	e^-_{R} $\frac{-3}{2}$, e^-_{G} $\frac{-1}{2}$, e^-_{B} $\frac{+1}{2}$	μ^-_{R} $\frac{-5}{2}$, μ^-_{G} $\frac{-3}{2}$, μ^-_{B} $\frac{-1}{2}$	τ^-_{R} $\frac{-7}{2}$, τ^-_{G} $\frac{-5}{2}$, τ^-_{B} $\frac{-3}{2}$
	$\upsilon_{\tau R}+\upsilon_{\tau G}+\upsilon_{\tau B}$ $\frac{+15}{2}$	$\upsilon_{\mu R}+\upsilon_{\mu G}+\upsilon_{\mu B}$ $\frac{+9}{2}$	$\upsilon_{eR}+\upsilon_{eG}+\upsilon_{eB}$ $\frac{+3}{2}$	$e^-_{R}+e^-_{G}+e^-_{B}$ $\frac{-3}{2}$	$\mu^-_{R}+\mu^-_{G}+\mu^-_{B}$ $\frac{-9}{2}$	$\tau^-_{R}+\tau^-_{G}+\tau^-_{B}$ $\frac{-15}{2}$
anti-lepton flavor $\bar r$	$\bar\upsilon_\tau$	$\bar\upsilon_\mu$	$\bar\upsilon_e$	e^+	μ^+	τ^+
$I_3(\bar l_{\bar\alpha})$	$I_3(\bar\upsilon_\tau)$ $\frac{-5}{2}$	$I_3(\bar\upsilon_\mu)$ $\frac{-3}{2}$	$I_3(\bar\upsilon_e)$ $\frac{-1}{2}$	$I_3(e^+)$ $\frac{+1}{2}$	$I_3(\mu^+)$ $\frac{+3}{2}$	$I_3(\tau^+)$ $\frac{+5}{2}$
$\bar l_{\bar\alpha}$ $\bar l_{\mathrm{RGB}}$	$\bar\upsilon_{\tau\bar R}$ $\frac{-3}{2}$, $\bar\upsilon_{\tau\bar G}$ $\frac{-5}{2}$, $\bar\upsilon_{\tau\bar B}$ $\frac{-7}{2}$	$\bar\upsilon_{\mu\bar R}$ $\frac{-1}{2}$, $\bar\upsilon_{\mu\bar G}$ $\frac{-3}{2}$, $\bar\upsilon_{\mu\bar B}$ $\frac{-5}{2}$	$\bar\upsilon_{e\bar R}$ $\frac{+1}{2}$, $\bar\upsilon_{e\bar G}$ $\frac{-1}{2}$, $\bar\upsilon_{e\bar B}$ $\frac{-3}{2}$	$e^+_{\bar R}$ $\frac{+3}{2}$, $e^+_{\bar G}$ $\frac{+1}{2}$, $e^+_{\bar B}$ $\frac{-1}{2}$	$\mu^+_{\bar R}$ $\frac{+5}{2}$, $\mu^+_{\bar G}$ $\frac{+3}{2}$, $\mu^+_{\bar B}$ $\frac{+1}{2}$	$\tau^+_{\bar R}$ $\frac{+7}{2}$, $\tau^+_{\bar G}$ $\frac{+5}{2}$, $\tau^+_{\bar B}$ $\frac{+3}{2}$
	$\bar\upsilon_{\tau\bar R}+\bar\upsilon_{\tau\bar G}+\bar\upsilon_{\tau\bar B}$ $\frac{-15}{2}$	$\bar\upsilon_{\mu\bar R}+\bar\upsilon_{\mu\bar G}+\bar\upsilon_{\mu\bar B}$ $\frac{-9}{2}$	$\bar\upsilon_{e\bar R}+\bar\upsilon_{e\bar G}+\bar\upsilon_{e\bar B}$ $\frac{-3}{2}$	$e^+_{\bar R}+e^+_{\bar G}+e^+_{\bar B}$ $\frac{+9}{6}=\frac{+3}{2}$	$\mu^+_{\bar R}+\mu^+_{\bar G}+\mu^+_{\bar B}$ $\frac{+27}{6}=\frac{+9}{2}$	$\tau^+_{\bar R}+\tau^+_{\bar G}+\tau^+_{\bar B}$ $\frac{+45}{6}=\frac{+15}{2}$

• Remark: we see the color values $l_{\text{R}}, l_{\text{G}}, l_{\text{B}}$ of each lepton in Table2 are selected from the third components $\pi_3(l)$ of one-half spin $\vec{\pi}(l)$ below

$$\pi_3(l) \ = \ \ldots, \underline{\tfrac{-9}{2}, \tfrac{-7}{2}, \tfrac{-5}{2}, \tfrac{-3}{2}, \tfrac{-1}{2}}, \underline{\tfrac{+1}{2}, \tfrac{+3}{2}, \tfrac{+5}{2}, \tfrac{+7}{2}, \tfrac{+9}{2}}, \ldots \quad \subseteq \ l_{\text{RGB}} \ \equiv \ l_{\text{R}}, l_{\text{G}}, l_{\text{B}} \tag{0.7}$$

$$\vec{\pi}(l) \times \vec{\pi}(l) \ = \ i\vec{\pi}(l) \tag{0.8}$$

Comparability between color freedom of quarks [1] and that of leptons above:

Quark are closed-color, color confinement, quark color $q_\alpha = q_{\text{RGB}} \ \subseteq$ one-sixth series [7]

Lepton are opened-color, color freer, lepton color $l_\alpha = l_{\text{RGB}} \ \subseteq$ one-half series (0.7).

Both quark $\pi_3(q)$ and lepton $\pi_3(l)$ are the third components of Non-Hermitian spin angular momentum $\vec{\pi}$ in Spin Topological Space STS.[11]. $\pi_3(q)$ and $\pi_3(l)$ are Hermitian operators in STS.

This paper are particular about neutrino lepton numbers, further Table1 is down to Table3 below

Table 3: Lepton Numbers of Neutrinos $\upsilon_e, \upsilon_\mu, \upsilon_\tau$

Particle	Lepton number L	||	Electron Lepton number L_e	Muon Lepton number L_μ	Tau Lepton number L_τ
υ_e	+1	|	+1	0	0
υ_μ	+1	|	0	+1	0
υ_τ	+1	|	0	0	+1

2. Color Scalar Products $\mathrm{L}(\upsilon^{\dagger'}\upsilon')$ of Neutrino Lepton Number

Inspire with the idea of quarkcolor scalar product [10] and base on **ansatz**, *Color Similarity* mentioned previously, further an amusing *leptoncolor scalar product* is introduced to essential of lepton numbers $\mathrm{L}_e, \mathrm{L}_\mu, \mathrm{L}_\tau$ of six leptons and six antileptons in Table1. This paper lays emphases on neutral leptons, neutrinos, then the *leptoncolor scalar product* representations of Table 3 are given on details following (0)

$$\mathrm{L}(\upsilon^{\dagger'}\upsilon') = \overrightarrow{\upsilon^{\dagger'}} \cdot \overrightarrow{\upsilon'} = \underbrace{\begin{pmatrix} \overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_e'}\blacklozenge & \overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} & \overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} \\ \overrightarrow{\upsilon_\mu^{\dagger'}} \cdot \overrightarrow{\upsilon_e'} & \overrightarrow{\upsilon_\mu^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} & \overrightarrow{\upsilon_\mu^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} \\ \overrightarrow{\upsilon_\tau^{\dagger'}} \cdot \overrightarrow{\upsilon_e'} & \overrightarrow{\upsilon_\tau^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} & \overrightarrow{\upsilon_\tau^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} \end{pmatrix}}_{\text{Matrix(4)}} = \underbrace{\begin{pmatrix} +1.000 & 0.000 & 0.000 \\ 0.000 & +1.000 & 0.000 \\ 0.000 & 0.000 & +1.000 \end{pmatrix}}_{\text{Matrix(5)}} = \begin{pmatrix} 【A】 & 【D】 & 【F】 \\ 【E】 & 【B】 & 【H】 \\ 【G】 & 【I】 & 【C】 \end{pmatrix} \quad (0)$$

Matrix(5) is the digit graph of lepton number conservation (Table1).

From now on, we discuss the case of the left handed neutrino family $\upsilon = \upsilon_L$.

Example V_{11} of $\overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_e'}\blacklozenge = +1.000\blacklozenge$ in expression (0) with Table3 below (left handed neutrino υ_L) is given explicitly following

$$\overrightarrow{\upsilon_e^{\dagger'}} = \vec{\upsilon}_e + \vec{\Phi}_{\upsilon_e^\dagger} \qquad (1)$$

$$\overrightarrow{\upsilon_e'} = \vec{\upsilon}_e + \vec{\Phi}_{\upsilon_e} \qquad (2)$$

and *lepton weak interaction paring* $\vec{\Phi}$

$$\vec{\Phi}_{\upsilon_e^\dagger} = \left(\tfrac{+4}{6}, \tfrac{+1}{6}, \tfrac{-5}{6}\right), \qquad I_3(\Phi_{\upsilon_e^\dagger}) = \tfrac{1}{3}\left(\tfrac{+4}{6} + \tfrac{+1}{6} + \tfrac{-5}{6}\right) = 0$$

$$\vec{\Phi}_{\upsilon_e} = \left(\tfrac{+1}{2}, \tfrac{-1}{2}, \tfrac{0}{2}\right), \qquad I_3(\Phi_{\upsilon_e}) = \tfrac{1}{3}\left(\tfrac{+1}{2} + \tfrac{-1}{2} + \tfrac{0}{2}\right) = 0$$

$$\vec{\Phi}_{\upsilon_e^\dagger} \cdot \vec{\Phi}_{\upsilon_e} = \left(\tfrac{+4}{6}, \tfrac{+1}{6}, \tfrac{-5}{6}\right)\left(\tfrac{+1}{2}, \tfrac{-1}{2}, \tfrac{0}{2}\right) = \tfrac{+1}{4} \qquad (3)$$

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Further

$$\overrightarrow{\upsilon_e^{\dagger'}} = \vec{\upsilon}_e + \vec{\Phi}_{\upsilon_e^\dagger} = \left(\tfrac{-1}{2}, \tfrac{+1}{2}, \tfrac{+3}{2}\right) + \left(\tfrac{+4}{6}, \tfrac{+1}{6}, \tfrac{-5}{6}\right) = \underline{\left(\tfrac{+1}{6}, \tfrac{+4}{6}, \tfrac{+4}{6}\right)} \tag{4}$$

$$I_3(\upsilon_e^{\dagger'}) = \tfrac{1}{3}\left(\tfrac{+1}{6} + \tfrac{+4}{6} + \tfrac{+4}{6}\right) = \tfrac{1}{3}\left(\tfrac{+9}{6}\right) = \tfrac{+1}{2}$$

$$\overrightarrow{\upsilon_e'} = \vec{\upsilon}_e + \vec{\Phi}_{\upsilon_e} = \left(\tfrac{-1}{2}, \tfrac{+1}{2}, \tfrac{+3}{2}\right) + \left(\tfrac{+1}{2}, \tfrac{-1}{2}, \tfrac{0}{2}\right) = \underline{\left(\tfrac{0}{6}, \tfrac{0}{6}, \tfrac{+9}{6}\right)} \tag{5}$$

$$I_3(\upsilon_e') = \tfrac{1}{3}\left(\tfrac{0}{6} + \tfrac{0}{6} + \tfrac{+9}{6}\right) = \tfrac{1}{3}\left(\tfrac{+9}{6}\right) = \tfrac{+1}{2}$$

Finally

$$\begin{aligned}\overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_e'}\blacklozenge = (\vec{\upsilon}_e + \vec{\Phi}_{\upsilon_e^\dagger}) \cdot (\vec{\upsilon}_e + \vec{\Phi}_{\upsilon_e}) &= \left(\tfrac{+1}{6}, \tfrac{+4}{6}, \tfrac{+4}{6}\right) \cdot \left(\tfrac{0}{6}, \tfrac{0}{6}, \tfrac{+9}{6}\right) \\ &= \tfrac{1}{36}\{\ 0 + 0 + 36\ \} = \tfrac{1}{36}\{\ +36\ \} = +1.000\end{aligned} \tag{6}$$

The processes of the eight other elements in expression (0) could be obtained as the same way (as notation "♦") following：

- • $$\overrightarrow{\upsilon_\alpha^{\dagger'}} \cdot \overrightarrow{\upsilon_e'} = \begin{pmatrix} \overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_e'}\blacklozenge \text{【A】} \\ \overrightarrow{\upsilon_\mu^{\dagger'}} \cdot \overrightarrow{\upsilon_e'} \text{【E】} \\ \overrightarrow{\upsilon_\tau^{\dagger'}} \cdot \overrightarrow{\upsilon_e'} \text{【G】} \end{pmatrix} = \begin{pmatrix} \frac{+1}{6} & \frac{+4}{6} & \frac{+4}{6} \\ \frac{+12}{6} & \frac{+15}{6} & \frac{0}{6} \\ \frac{+21}{6} & \frac{+24}{6} & \frac{0}{6} \end{pmatrix} \begin{pmatrix} \frac{0}{6} \\ \frac{0}{6} \\ \frac{+9}{6} \end{pmatrix} = \begin{pmatrix} \frac{+36}{36} = 1.000 \\ 0.000 \\ 0.000 \end{pmatrix} \tag{7}$$

- • $$\overrightarrow{\upsilon_\alpha^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} = \begin{pmatrix} \overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} \text{【D】} \\ \overrightarrow{\upsilon_\mu^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} \text{【B】} \\ \overrightarrow{\upsilon_\tau^{\dagger'}} \cdot \overrightarrow{\upsilon_\mu'} \text{【I】} \end{pmatrix} = \begin{pmatrix} \frac{+6}{6} & \frac{+9}{6} & \frac{-6}{6} \\ \frac{+19}{6} & \frac{+22}{6} & \frac{-14}{6} \\ \frac{+36}{6} & \frac{+39}{6} & \frac{-30}{6} \end{pmatrix} \begin{pmatrix} \frac{+6}{6} \\ \frac{+6}{6} \\ \frac{+15}{6} \end{pmatrix} = \begin{pmatrix} 0.000 \\ \frac{+36}{36} = 1.000 \\ 0.000 \end{pmatrix} \tag{8}$$

- • $$\overrightarrow{\upsilon_\alpha^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} = \begin{pmatrix} \overrightarrow{\upsilon_e^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} \text{【F】} \\ \overrightarrow{\upsilon_\mu^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} \text{【H】} \\ \overrightarrow{\upsilon_\tau^{\dagger'}} \cdot \overrightarrow{\upsilon_\tau'} \text{【C】} \end{pmatrix} = \begin{pmatrix} \frac{+9}{6} & \frac{+12}{6} & \frac{-12}{6} \\ \frac{+30}{6} & \frac{+33}{6} & \frac{-36}{6} \\ \frac{+49}{6} & \frac{+52}{6} & \frac{-56}{6} \end{pmatrix} \begin{pmatrix} \frac{+12}{6} \\ \frac{+12}{6} \\ \frac{+21}{6} \end{pmatrix} = \begin{pmatrix} 0.000 \\ 0.000 \\ \frac{+36}{36} = 1.000 \end{pmatrix} \tag{9}$$

3. Color Scalar Products $\overrightarrow{\upsilon^{\dagger'}} \cdot \vec{n}$ of Broken Neutrino Lepton Number $L_{\text{BROKEN}}(\upsilon)$

- Definition of Broken Neutrino Lepton Number

$$L_{\text{Broken}}(\upsilon) = \overrightarrow{\upsilon^{\dagger'}_{\alpha}} \cdot \vec{n}_{\beta} = \begin{pmatrix} \overrightarrow{\upsilon^{\dagger'}_{e}} \cdot \vec{n}_e & \overrightarrow{\upsilon^{\dagger'}_{e}} \cdot \vec{n}_\mu & \overrightarrow{\upsilon^{\dagger'}_{e}} \cdot \vec{n}_\tau \\ \overrightarrow{\upsilon^{\dagger'}_{\mu}} \cdot \vec{n}_e & \overrightarrow{\upsilon^{\dagger'}_{\mu}} \cdot \vec{n}_\mu & \overrightarrow{\upsilon^{\dagger'}_{\mu}} \cdot \vec{n}_\tau \\ \overrightarrow{\upsilon^{\dagger'}_{\tau}} \cdot \vec{n}_e & \overrightarrow{\upsilon^{\dagger'}_{\tau}} \cdot \vec{n}_\mu & \overrightarrow{\upsilon^{\dagger'}_{\tau}} \cdot \vec{n}_\tau \end{pmatrix}, \qquad \alpha, \beta = e, \mu, \tau \tag{10}$$

Where below

- *Leptoncolor brokenon* $\vec{n}_\beta$ of lepton weak interaction paring $\vec{\Phi}$ in neutrino flovor oscillations are given following

$$\vec{n}_\beta = (n_1, n_2, n_3)_\beta, \qquad \beta = e, \mu, \tau \tag{11}$$

OR

$$\vec{n}_e = (n_1, n_2, n_3)_e = \left(\tfrac{-12}{26}, \tfrac{+12}{26}, \tfrac{-27}{26}\right) \tag{11.1}$$

$$\vec{n}_\mu = (n_1, n_2, n_3)_\mu = \left(\tfrac{-5530}{3120}, \tfrac{-886}{3120}, \tfrac{-7987}{3120}\right) \tag{11.2}$$

$$\vec{n}_\tau = (n_1, n_2, n_3)_\tau = \left(\tfrac{-292}{120}, \tfrac{-328}{120}, \tfrac{-553}{120}\right) \tag{11.3}$$

Using Table2 and (11.1),(11.2),(11.3), the nine elements in expression (10) could be obtained following:

An example of color scalar products with $\overrightarrow{\upsilon^{\dagger'}_{\alpha}} \cdot \vec{n}_e$, $\overrightarrow{\upsilon^{\dagger'}_{\mu}} \cdot \vec{n}_e$, $\overrightarrow{\upsilon^{\dagger'}_{\tau}} \cdot \vec{n}_e$ (12.1)♦ are given below

$$V_{11} \quad \overrightarrow{\upsilon^{\dagger'}_{e}} \cdot \vec{n}_e = \left(\tfrac{+1}{6}, \tfrac{+4}{6}, \tfrac{+4}{6}\right)\left(\tfrac{-12}{26}, \tfrac{+12}{26}, \tfrac{-27}{26}\right) = \tfrac{1}{156}(-12 + 48 - 108) = \tfrac{-72}{156} = \tfrac{-12}{26} = \tfrac{-120}{260}$$

$$V_{21} \quad \overrightarrow{\upsilon^{\dagger'}_{\mu}} \cdot \vec{n}_e = \left(\tfrac{+12}{6}, \tfrac{+15}{6}, \tfrac{0}{6}\right)\left(\tfrac{-12}{26}, \tfrac{+12}{26}, \tfrac{-27}{26}\right) = \tfrac{1}{156}(-144 + 180 + 0) = \tfrac{+36}{156} = \tfrac{+6}{26} = \tfrac{+60}{260}$$

$$V_{31} \quad \overrightarrow{\upsilon^{\dagger'}_{\tau}} \cdot \vec{n}_e = \left(\tfrac{+21}{6}, \tfrac{+24}{6}, \tfrac{0}{6}\right)\left(\tfrac{-12}{26}, \tfrac{+12}{26}, \tfrac{-27}{26}\right) = \tfrac{1}{156}(-252 + 288 + 0) = \tfrac{+36}{156} = \tfrac{+6}{26} = \tfrac{+60}{260}$$

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As the same way (as notation "♦")

$$\bullet\ \bullet \qquad \vec{\upsilon}_{\alpha}^{\dagger'} \cdot \vec{n}_{e} = \begin{pmatrix} \vec{\upsilon}_{e}^{\dagger'} \cdot \vec{n}_{e} \text{ [A]} \\ \vec{\upsilon}_{\mu}^{\dagger'} \cdot \vec{n}_{e} \text{ [E]} \\ \vec{\upsilon}_{\tau}^{\dagger'} \cdot \vec{n}_{e} \text{ [G]} \end{pmatrix} = \begin{pmatrix} \frac{+1}{6} & \frac{+4}{6} & \frac{+4}{6} \\ \frac{+12}{6} & \frac{+15}{6} & \frac{0}{6} \\ \frac{+21}{6} & \frac{+24}{6} & \frac{0}{6} \end{pmatrix} \begin{pmatrix} \frac{-12}{26} \\ \frac{+12}{26} \\ \frac{-27}{26} \end{pmatrix} = \begin{pmatrix} \frac{-120}{260} \\ \frac{+60}{260} \\ \frac{+60}{260} \end{pmatrix} \qquad (12.1)♦$$

$$\bullet\ \bullet \qquad \vec{\upsilon}_{\alpha}^{\dagger'} \cdot \vec{n}_{\mu} = \begin{pmatrix} \vec{\upsilon}_{e}^{\dagger'} \cdot \vec{n}_{\mu} \text{ [D]} \\ \vec{\upsilon}_{\mu}^{\dagger'} \cdot \vec{n}_{\mu} \text{ [B]} \\ \vec{\upsilon}_{\tau}^{\dagger'} \cdot \vec{n}_{\mu} \text{ [I]} \end{pmatrix} = \begin{pmatrix} \frac{+6}{6} & \frac{+9}{6} & \frac{-6}{6} \\ \frac{+19}{6} & \frac{+22}{6} & \frac{-14}{6} \\ \frac{+36}{6} & \frac{+39}{6} & \frac{-30}{6} \end{pmatrix} \begin{pmatrix} \frac{-5530}{3120} \\ \frac{-886}{3120} \\ \frac{-7987}{3120} \end{pmatrix} = \begin{pmatrix} \frac{-94}{260} \\ \frac{-177}{260} \\ \frac{+83}{260} \end{pmatrix} \qquad (12.2)$$

$$\bullet\ \bullet \qquad \vec{\upsilon}_{\alpha}^{\dagger'} \cdot \vec{n}_{\tau} = \begin{pmatrix} \vec{\upsilon}_{e}^{\dagger'} \cdot \vec{n}_{\tau} \text{ [F]} \\ \vec{\upsilon}_{\mu}^{\dagger'} \cdot \vec{n}_{\tau} \text{ [H]} \\ \vec{\upsilon}_{\tau}^{\dagger'} \cdot \vec{n}_{\tau} \text{ [C]} \end{pmatrix} = \begin{pmatrix} \frac{+9}{6} & \frac{+12}{6} & \frac{-12}{6} \\ \frac{+30}{6} & \frac{+33}{6} & \frac{-36}{6} \\ \frac{+49}{6} & \frac{+52}{6} & \frac{-56}{6} \end{pmatrix} \begin{pmatrix} \frac{-292}{120} \\ \frac{-328}{120} \\ \frac{-553}{120} \end{pmatrix} = \begin{pmatrix} \frac{+26}{260} \\ \frac{+117}{260} \\ \frac{-143}{260} \end{pmatrix} \qquad (12.3)$$

The above three results are put into (10), obtain below

$$\mathrm{L}_{\mathrm{Broken}}(\upsilon) = \begin{pmatrix} \vec{\upsilon}_{e}^{\dagger'} \cdot \vec{n}_{e} & \vec{\upsilon}_{e}^{\dagger'} \cdot \vec{n}_{\mu} & \vec{\upsilon}_{e}^{\dagger'} \cdot \vec{n}_{\tau} \\ \vec{\upsilon}_{\mu}^{\dagger'} \cdot \vec{n}_{e} & \vec{\upsilon}_{\mu}^{\dagger'} \cdot \vec{n}_{\mu} & \vec{\upsilon}_{\mu}^{\dagger'} \cdot \vec{n}_{\tau} \\ \vec{\upsilon}_{\tau}^{\dagger'} \cdot \vec{n}_{e} & \vec{\upsilon}_{\tau}^{\dagger'} \cdot \vec{n}_{\mu} & \vec{\upsilon}_{\tau}^{\dagger'} \cdot \vec{n}_{\tau} \end{pmatrix} = \begin{pmatrix} \frac{-120}{260} & \frac{+94}{260} & \frac{+26}{260} & 0.000 \\ \frac{+60}{260} & \frac{-177}{260} & \frac{+117}{260} & 0.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{-143}{260} & 0.000 \\ 0.000 & 0.000 & 0.000 & \frac{-440}{260} = \frac{-22}{13} \end{pmatrix} = \begin{pmatrix} \text{【A】} & \text{【D】} & \text{【F】} \\ \text{【E】} & \text{【B】} & \text{【H】} \\ \text{【G】} & \text{【I】} & \text{【C】} \end{pmatrix} \qquad (13)$$

Matrix(6) Matrix(7)

Matrix(7) is the digit graph of broken neutrino lepton number $\mathrm{L}_{\mathrm{Broken}}(\upsilon)$.

4. Neutrino Mass Lepton Number $L_{MASS}(\upsilon)$, Neutrino Lepton Coupling Constant $G_L(\upsilon)$ and PMNS U_{PMNS}

Plus $L(\upsilon^{\dagger\prime}\upsilon^{\prime})$ (0) and $L_{Broken}(\upsilon)$ (13), Obtain (14) below

$$L(\upsilon^{\dagger\prime}\upsilon^{\prime}) + L_{Broken}(\upsilon) = \begin{pmatrix} \overrightarrow{\upsilon_e^{\dagger\prime}} \cdot \overrightarrow{\upsilon_e^{\prime}} & \overrightarrow{\upsilon_e^{\dagger\prime}} \cdot \overrightarrow{\upsilon_\mu^{\prime}} & \overrightarrow{\upsilon_e^{\dagger\prime}} \cdot \overrightarrow{\upsilon_\tau^{\prime}} \\ \overrightarrow{\upsilon_\mu^{\dagger\prime}} \cdot \overrightarrow{\upsilon_e^{\prime}} & \overrightarrow{\upsilon_\mu^{\dagger\prime}} \cdot \overrightarrow{\upsilon_\mu^{\prime}} & \overrightarrow{\upsilon_\mu^{\dagger\prime}} \cdot \overrightarrow{\upsilon_\tau^{\prime}} \\ \overrightarrow{\upsilon_\tau^{\dagger\prime}} \cdot \overrightarrow{\upsilon_e^{\prime}} & \overrightarrow{\upsilon_\tau^{\dagger\prime}} \cdot \overrightarrow{\upsilon_\mu^{\prime}} & \overrightarrow{\upsilon_\tau^{\dagger\prime}} \cdot \overrightarrow{\upsilon_\tau^{\prime}} \end{pmatrix} + \begin{pmatrix} \overrightarrow{\upsilon_e^{\dagger\prime}} \cdot \overrightarrow{n}_e & \overrightarrow{\upsilon_e^{\dagger\prime}} \cdot \overrightarrow{n}_\mu & \overrightarrow{\upsilon_e^{\dagger\prime}} \cdot \overrightarrow{n}_\tau \\ \overrightarrow{\upsilon_\mu^{\dagger\prime}} \cdot \overrightarrow{n}_e & \overrightarrow{\upsilon_\mu^{\dagger\prime}} \cdot \overrightarrow{n}_\mu & \overrightarrow{\upsilon_\mu^{\dagger\prime}} \cdot \overrightarrow{n}_\tau \\ \overrightarrow{\upsilon_\tau^{\dagger\prime}} \cdot \overrightarrow{n}_e & \overrightarrow{\upsilon_\tau^{\dagger\prime}} \cdot \overrightarrow{n}_\mu & \overrightarrow{\upsilon_\tau^{\dagger\prime}} \cdot \overrightarrow{n}_\tau \end{pmatrix}$$

$$\begin{pmatrix} +1.000 & 0.000 & 0.000 & +1.000 \\ 0.000 & +1.000 & 0.000 & +1.000 \\ 0.000 & 0.000 & +1.000 & +1.000 \\ +1.000 & +1.000 & +1.000 & +3.000 \end{pmatrix} + \begin{pmatrix} \frac{-120}{260} & \frac{+94}{260} & \frac{+26}{260} & 0.000 \\ \frac{+60}{260} & \frac{-177}{260} & \frac{+117}{260} & 0.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{-143}{260} & 0.000 \\ 0.000 & 0.000 & 0.000 & \frac{-440}{260} = \frac{-22}{13} \end{pmatrix} = \begin{pmatrix} \frac{+140}{260} & \frac{+94}{260} & \frac{+26}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ 1.000 & 1.000 & 1.000 & \frac{+340}{260} = \frac{+17}{13} \end{pmatrix} \quad (14)$$

We call the right term in expression (14), *Neutrino Mass Lepton Number* $L_{Mass}(\upsilon)$ below

- $$L_{Mass}(\upsilon) = \begin{pmatrix} \frac{+140}{260} & \frac{+94}{260} & \frac{+26}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ 1.000 & 1.000 & 1.000 & \frac{+340}{260} = \frac{+17}{13} \end{pmatrix} \quad (15)$$

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- Introduce a marvellous constant, $\mathrm{G}_L(\upsilon) = \left(\frac{13}{8}\right)$ (16)

Multiply $\mathrm{G}_L(\upsilon)$ (16) and $\mathrm{L}_{\text{Mass}}(\upsilon)$ (15), (or Matrix(10) below)

$$\mathrm{G}_L(\upsilon) \cdot \mathrm{L}_{\text{Mass}}(\upsilon)$$

$$= \mathrm{G}_L(\upsilon) \cdot \begin{pmatrix} \frac{+140}{260} & \frac{+94}{260} & \frac{+26}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ 1.000 & 1.000 & 1.000 & \frac{+17}{13} \end{pmatrix} = \left(\frac{13}{8}\right) \begin{pmatrix} \frac{+140}{260} & \frac{+94}{260} & \frac{+26}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ \frac{+60}{260} & \frac{+83}{260} & \frac{+117}{260} & 1.000 \\ 1.000 & 1.000 & 1.000 & \frac{+17}{13} \end{pmatrix}$$

$$= \begin{pmatrix} \frac{+140}{160} & \frac{+94}{160} & \frac{+26}{160} & \frac{+260}{160} \\ \frac{+60}{160} & \frac{+83}{160} & \frac{+117}{160} & \frac{+260}{160} \\ \frac{+60}{160} & \frac{+83}{160} & \frac{+117}{160} & \frac{+260}{160} \\ \frac{+260}{160} & \frac{+260}{160} & \frac{+260}{160} & \frac{+17}{8} \end{pmatrix} = \begin{pmatrix} 0.875 & 0.5875 & 0.1625 & 1.625 \\ 0.375 & 0.51875 & 0.73125 & 1.625 \\ 0.375 & 0.51875 & 0.73125 & 1.625 \\ 1.625 & 1.625 & 1.625 & 2.125 \end{pmatrix} = |U_{\text{PMNS}}| \quad (17)$$

Comparing (17) with Matrix(1), Matrix(2) and Matrix(3) mentioned previously, we obtain an interesting result below:

■■■■■ $|U_{\text{PMNS}}|$ = **Neutrino Lepton Coupling Constant** $\mathrm{G}_L(\upsilon)$ • **Neutrino Mass Lepton Number** $\mathrm{L}_{\text{Mass}}(\upsilon)$ ■■■■■

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5. Neutrino Background Lepton Number $L_{\text{Background}}(\upsilon)$ and Dark Matter-Energy $E_{\text{DME}}(\upsilon)$

For a more understanding of formula (14) and formula (17), we transform the left second term, $L_{\text{Broken}}(\upsilon)$ to the righr side, further formula (14) turns to (18) below

$$\begin{pmatrix} +1.000_{11} & 0.000_{12} & 0.000_{13} & +1.000 \\ 0.000_{21} & +1.000_{22} & 0.000_{23} & +1.000 \\ 0.000_{31} & 0.000_{32} & +1.000_{33} & +1.000 \\ +1.000 & +1.000 & +1.000 & +3.000 \end{pmatrix} = \begin{pmatrix} \frac{+120}{260}_{11} & \frac{-94}{260}_{12} & \frac{-26}{260}_{13} & 0.000 \\ \frac{-60}{260}_{21} & \frac{+177}{260}_{22} & \frac{-117}{260}_{23} & 0.000 \\ \frac{-60}{260}_{31} & \frac{-83}{260}_{32} & \frac{+143}{260}_{33} & 0.000 \\ 0.000 & 0.000 & 0.000 & \frac{+440}{260}=\frac{+22}{13} \end{pmatrix} + \begin{pmatrix} \frac{+140}{260}_{11} & \frac{+94}{260}_{12} & \frac{+26}{260}_{13} & 1.000 \\ \frac{+60}{260}_{21} & \frac{+83}{260}_{22} & \frac{+117}{260}_{23} & 1.000 \\ \frac{+60}{260}_{31} & \frac{+83}{260}_{32} & \frac{+117}{260}_{33} & 1.000 \\ 1.000 & 1.000 & 1.000 & \frac{+340}{260}=\frac{+17}{13} \end{pmatrix} \quad (18)$$

$$\text{Matrix(8)} \quad = \quad \text{Matrix(9)} \quad + \quad \text{Matrix(10)}$$

$$\Uparrow\Uparrow\Uparrow \qquad\qquad \Uparrow\Uparrow\Uparrow \qquad\qquad \Uparrow\Uparrow\Uparrow$$

$$L(\upsilon^{\dagger'}\upsilon') \qquad\qquad L_{\text{Background}}(\upsilon) \qquad\qquad L_{\text{Mass}}(\upsilon)$$

Lepton Number Conservation = Neutrino Background Lepton Number + Neutrino Mass Lepton Number

$$+3.000 = \frac{39}{13} \qquad \frac{22}{13} \Big/ \frac{39}{13} = \frac{22}{39} \approx 56\% \qquad \frac{+17}{13} \Big/ \frac{39}{13} = \frac{17}{39} \approx 44\%$$

Here

$$\text{Neutrino Background Lepton Number } L_{\text{Background}}(\upsilon) = -\left(\text{Broken Neutrino Lepton Number } L_{\text{Broken}}(\upsilon) \right) \quad (19)$$

Next analogous to the process of (16) and (17), Matrix(10), we multiply $G_L(\upsilon)$ (16) and Matrix(9) in (18) above. Further obtain (20) following

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$$\mathrm{G}_L(\upsilon) \cdot \mathrm{L}_{\text{Background}}(\upsilon)$$

$$= \mathrm{G}_L(\upsilon) \cdot \begin{pmatrix} \frac{+120}{260} & \frac{-94}{260} & \frac{-26}{260} & 0.000 \\ \frac{-60}{260} & \frac{+177}{260} & \frac{-117}{260} & 0.000 \\ \frac{-60}{260} & \frac{-83}{260} & \frac{+143}{260} & 0.000 \\ 0.000 & 0.000 & 0.000 & \frac{+22}{13} \end{pmatrix} = \left(\frac{13}{8}\right) \begin{pmatrix} \frac{+120}{260} & \frac{-94}{260} & \frac{-26}{260} & 0.000 \\ \frac{-60}{260} & \frac{+177}{260} & \frac{-117}{260} & 0.000 \\ \frac{-60}{260} & \frac{-83}{260} & \frac{+143}{260} & 0.000 \\ 0.000 & 0.000 & 0.000 & \frac{+22}{13} \end{pmatrix}$$

$$= \begin{pmatrix} \frac{+120}{160} & \frac{-94}{160} & \frac{-26}{160} & 0.000 \\ \frac{-60}{160} & \frac{+177}{160} & \frac{-117}{160} & 0.000 \\ \frac{-60}{160} & \frac{-83}{160} & \frac{-143}{160} & 0.000 \\ 0.000 & 0.000 & 0.000 & \frac{+22}{8} \end{pmatrix} = \begin{pmatrix} +0.750 & -0.5875 & -0.1625 & 0.000 \\ -0.375 & +1.10625 & -0.73125 & 0.000 \\ -0.375 & -0.51875 & +0.89375 & 0.000 \\ 0.000 & 0.000 & 0.000 & 2.75 \end{pmatrix} = U_{\text{Background}} \qquad (20)$$

We call formular (20) $U_{\text{Background}} = \mathrm{G}_L(\upsilon) \cdot \mathrm{L}_{\text{Background}}(\upsilon)$, **Neutrino Dark Matter-Energy** $E_{\textbf{DME}}(\upsilon)$, resulted from neutrino background lepton number, which accounts to 56% of that total lepton number conservation, a slight large than $|U_{\text{PMNS}}|$ 44% resulted from Neutrino Mass Lepton Number

- To obtain experimenltal observations, after the diagonalization of neutrino lepton mumber (18), obtain (21) below:

$$\mathrm{L}(\upsilon^{\dagger'}\upsilon')_{\text{diagonal}} = \begin{pmatrix} \frac{+13}{13} & 0 & 0 & \frac{+13}{13} \\ 0 & \frac{+13}{13} & 0 & \frac{+13}{13} \\ 0 & 0 & \frac{+13}{13} & \frac{+13}{13} \\ \frac{+13}{13} & \frac{+13}{13} & \frac{+13}{13} & \frac{+39}{13} \end{pmatrix} = \begin{pmatrix} \frac{0}{13} & 0 & 0 & \frac{0}{13} \\ 0 & \frac{+9}{13} & 0 & \frac{+9}{13} \\ 0 & 0 & \frac{+13}{13} & \frac{+13}{13} \\ \frac{0}{13} & \frac{+9}{13} & \frac{+13}{13} & \frac{+22}{13} \end{pmatrix} + \begin{pmatrix} \frac{+13}{13} & 0 & 0 & \frac{+13}{13} \\ 0 & \frac{+4}{13} & 0 & \frac{+4}{13} \\ 0 & 0 & \frac{0}{13} & \frac{0}{13} \\ \frac{+13}{13} & \frac{+4}{13} & \frac{0}{13} & \frac{+17}{13} \end{pmatrix} \qquad (21)$$

lepton number $\mathrm{L}(\upsilon^{\dagger'}\upsilon') = \mathrm{L}_{\text{Background}}(\upsilon),\ E_{\textbf{DME}}(\upsilon) + \mathrm{L}_{\text{Mass}}(\upsilon)$

■a Then multiply $G_L(\upsilon) = (\frac{13}{8})$ and (21), gain (22) below

$$G_L(\upsilon) = \begin{pmatrix} \frac{+13}{8} & 0 & 0 & \frac{+13}{8} \\ 0 & \frac{+13}{8} & 0 & \frac{+13}{8} \\ 0 & 0 & \frac{+13}{8} & \frac{+13}{8} \\ \frac{+13}{8} & \frac{+13}{8} & \frac{+13}{8} & \frac{+39}{8} \end{pmatrix} = \begin{pmatrix} \frac{0}{8} & 0 & 0 & \frac{0}{8} \\ 0 & \frac{+9}{8} & 0 & \frac{+9}{8} \\ 0 & 0 & \frac{+13}{8} & \frac{+13}{8} \\ \frac{0}{8} & \frac{+9}{8} & \frac{+13}{8} & \frac{+22}{8} \end{pmatrix} + \begin{pmatrix} \frac{+13}{8} & 0 & 0 & \frac{+13}{8} \\ 0 & \frac{+4}{8} & 0 & \frac{+4}{8} \\ 0 & 0 & \frac{0}{8} & \frac{0}{8} \\ \frac{+13}{8} & \frac{+4}{8} & \frac{0}{8} & \frac{+17}{8} \end{pmatrix} \quad (22)$$

Matrix(11) = Matrix(12) + Matrix(13)

$G_L(\upsilon) = G_L(\upsilon)_{\text{Background}} + G_L(\upsilon)_{\text{Mass}}$

Trace of Matrix: $\frac{+13}{8} + \frac{+13}{8} + \frac{+13}{8} = \frac{+39}{8}$ $\quad\frac{+0}{8} + \frac{+9}{8} + \frac{+13}{8} = \frac{+22}{8}$ $\quad\frac{+13}{8} + \frac{+4}{8} + \frac{0}{8} = \frac{+17}{8}$

$\frac{+22}{8} / \frac{+39}{8} = \approx$ 56% $\quad\frac{+17}{8} / \frac{+39}{8} = \approx$ 44%

■b Last, again turn to (18), multiply $G_L(\upsilon) = (\frac{13}{8})$ and (18). gain (23) below

$$\begin{pmatrix} \frac{+13}{8} & 0 & 0 & \frac{+13}{8} \\ 0 & \frac{+13}{8} & 0 & \frac{+13}{8} \\ 0 & 0 & \frac{+13}{8} & \frac{+13}{8} \\ \frac{+13}{8} & \frac{+13}{8} & \frac{+13}{8} & \frac{+39}{8} \end{pmatrix} = \begin{pmatrix} \frac{+120}{160} & \frac{-94}{160} & \frac{-26}{160} & \frac{0}{160} \\ \frac{-60}{160} & \frac{+177}{160} & \frac{-117}{160} & \frac{0}{160} \\ \frac{-60}{160} & \frac{-83}{160} & \frac{+143}{160} & \frac{0}{160} \\ \frac{0}{160} & \frac{0}{160} & \frac{0}{160} & \frac{+440}{160} = \frac{+22}{8} \end{pmatrix} + \begin{pmatrix} \frac{+140}{160} & \frac{+94}{160} & \frac{+26}{160} & \frac{+260}{160} \\ \frac{+60}{160} & \frac{+83}{160} & \frac{+117}{160} & \frac{+260}{160} \\ \frac{+60}{160} & \frac{+83}{160} & \frac{+117}{160} & \frac{+260}{160} \\ \frac{+260}{160} & \frac{+260}{160} & \frac{+260}{160} & \frac{+340}{160} = \frac{+17}{8} \end{pmatrix} \quad (23)$$

If the diagonalization of (23), we could obtain (22) again.

Conclusions

- The conservation of Lepton number $L(\upsilon^{\dagger'}\upsilon')$ (18) is characterized by Matrix(8): in which there are three classifications of matrix element digit-sum below

1) Horizontal sum: $11 + 12 + 13 = +1.000 + 0.000 + 0.000 = +1.000$

$21 + 22 + 23 = 0.000 + 1.000 + 0.000 = +1.000$

$31 + 32 + 33 = 0.000 + 0.000 + 1.000 = +1.000$

2) Vertical sum: $11 + 21 + 31 = +1.000 + 0.000 + 0.000 = +1.000$

$12 + 22 + 32 = 0.000 + 1.000 + 0.000 = +1.000$

$13 + 23 + 33 = 0.000 + 0.000 + 1.000 = +1.000$

3) Diagonal sum: $11 + 22 + 33 = +1.000 + 1.000 + 1.000 = +3.000$ (24)

- Neutrino background lepton number $L_{\text{Background}}(\upsilon)$ is characterized by Matrix(9) below:

4) Horizontal sum: $11 + 12 + 13 = \frac{+120}{260} + \frac{-94}{260} + \frac{-26}{260} = 0.000$

$21 + 22 + 23 = \frac{-60}{260} + \frac{+177}{260} + \frac{-117}{260} = 0.000$

$31 + 32 + 33 = \frac{-60}{260} + \frac{-83}{260} + \frac{+143}{260} = 0.000$

5) Vertical sum: $11 + 21 + 31 = \frac{+120}{260} + \frac{-60}{260} + \frac{-60}{260} = 0.000$

$12 + 22 + 32 = \frac{-94}{260} + \frac{+177}{260} + \frac{-83}{260} = 0.000$

$13 + 23 + 33 = \frac{-26}{260} + \frac{-117}{260} + \frac{+143}{260} = 0.000$

6) Diagonal sum: $11 + 22 + 33 = \frac{+120}{260} + \frac{+177}{260} + \frac{+143}{260} = \frac{+440}{260} = \frac{+22}{13} \neq 0.000$ (25)

- Neutrino mass lepton number $\mathrm{L}_{\mathrm{Mass}}(\upsilon)$ is characterized by Matrix(10) below:

7) Horizontal sum: $11 + 12 + 13 = \frac{+140}{260} + \frac{+94}{260} + \frac{+26}{260} = +1.000$

$21 + 22 + 23 = \frac{+60}{260} + \frac{+83}{260} + \frac{+117}{260} = +1.000$

$31 + 32 + 33 = \frac{+60}{260} + \frac{+83}{260} + \frac{+117}{260} = +1.000$

8) Vertical sum: $11 + 21 + 31 = \frac{+140}{260} + \frac{+60}{260} + \frac{+60}{260} = +1.000$

$12 + 22 + 32 = \frac{+94}{260} + \frac{+83}{260} + \frac{+83}{260} = +1.000$

$13 + 23 + 33 = \frac{+26}{260} + \frac{+117}{260} + \frac{+117}{260} = +1.000$

9) Diagonal sum: $11 + 22 + 33 = \frac{+140}{260} + \frac{+83}{260} + \frac{+117}{260} = \frac{+340}{260} = \frac{+17}{13} \neq +3.000$ (26)

We see:

Lepton number $\mathrm{L}(\upsilon^{\dagger'}\upsilon')$ Matrix(8) could be decomposed into two parts, Matrix(9) $\mathrm{L}_{\mathrm{Background}}(\upsilon)$ and Matrix(10) $\mathrm{L}_{\mathrm{Mass}}(\upsilon)$.

1), 2) and 3) show: the conservation properties of Matrix(8) $\mathrm{L}(\upsilon^{\dagger'}\upsilon')$ in three different directions.

4), 5) show: the conservation properties of Matrix(9) $\mathrm{L}_{\mathrm{Background}}(\upsilon)$; but (6) shows the value of neutrino background lepton number is not zero, no a " really pure vacuum " ! its diagonal sum 6), trace is detectable.

7), 8) show: the conservation properties of Matrix(10) $\mathrm{L}_{\mathrm{Mass}}(\upsilon)$; but (9) shows the value of neutrino mass lepton number is Only Partly BE Broken in diagonal direction 9). BUT those along with horizontal and vertical directions are still conserved.

All that happened, are due to the *Leptoncolor brokenon* $\vec{n}_\beta$ of lepton weak interaction paring $\vec{\Phi}$ in neutrino flovor oscillations

$$\vec{n}_\beta = (n_1, n_2, n_3)_\beta, \qquad \beta = e, \mu, \tau \tag{11}$$

The nine digits, $\vec{n}_\beta$ which are restricted to the seven digit-sums conditions previously mentioned, three horizontal sums, three vertical sums and one diagonal sum. Remain two dependent parametes. that may be related to $\vec{n}_\beta \approx$ Higgs particle ?

Physical observable matrix $|U_{\mathrm{PMNS}}| = \mathrm{G}_L(\upsilon) \cdot$ (broken quantum operator, neutrino mass lepton number $\mathrm{L}_{\mathrm{Mass}}(\upsilon)$)

Neutrino dark matter-energy $E_{\mathrm{DME}}(\upsilon) = U_{\mathrm{Background}} = \mathrm{G}_L(\upsilon) \cdot$ (broken quantum operator, neutrino backgroud lepton number $\mathrm{L}_{\mathrm{Background}}(\upsilon)$)

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Non-Schroedinger Orbitals

By Stanislav Ordin

The Russian Academy of Sciences

Abstract- Schrödinger's "searchlight" made it possible to enlighten the atom and cast shadows on the "Screen of the Observer". But the main trouble of the modern "Quantum Theory" is precisely that it mistook the shadows from the "Elephant" for the "Elephant" itself, for Reality. This led to a catastrophic discrepancy between the allowed calculated energy levels of electrons and the experimental ionization potentials with an increase in the mass of atoms. But the inclusion of "normal illumination" - UNDERSTANDING gives a REAL Quantum Theory, which can be built on the path laid by Planck-de Broglie-Einstein-Heisenberg-Bohm. Quantization adds a new INVARIANT and strictly mathematically, according to Planck, expands complements the Classics, and does not deny it - Resonant orbits of electrons in atoms - Electronic Orbitals correspond to resonant de Broglie waves. And Pontryagin's Dualism of Functional Sets translates Schrödinger's Uncertainty Principle into the Principle of CERTAINTY=OBSERVABILITY.

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NONSCHROEDINGERORBITALS

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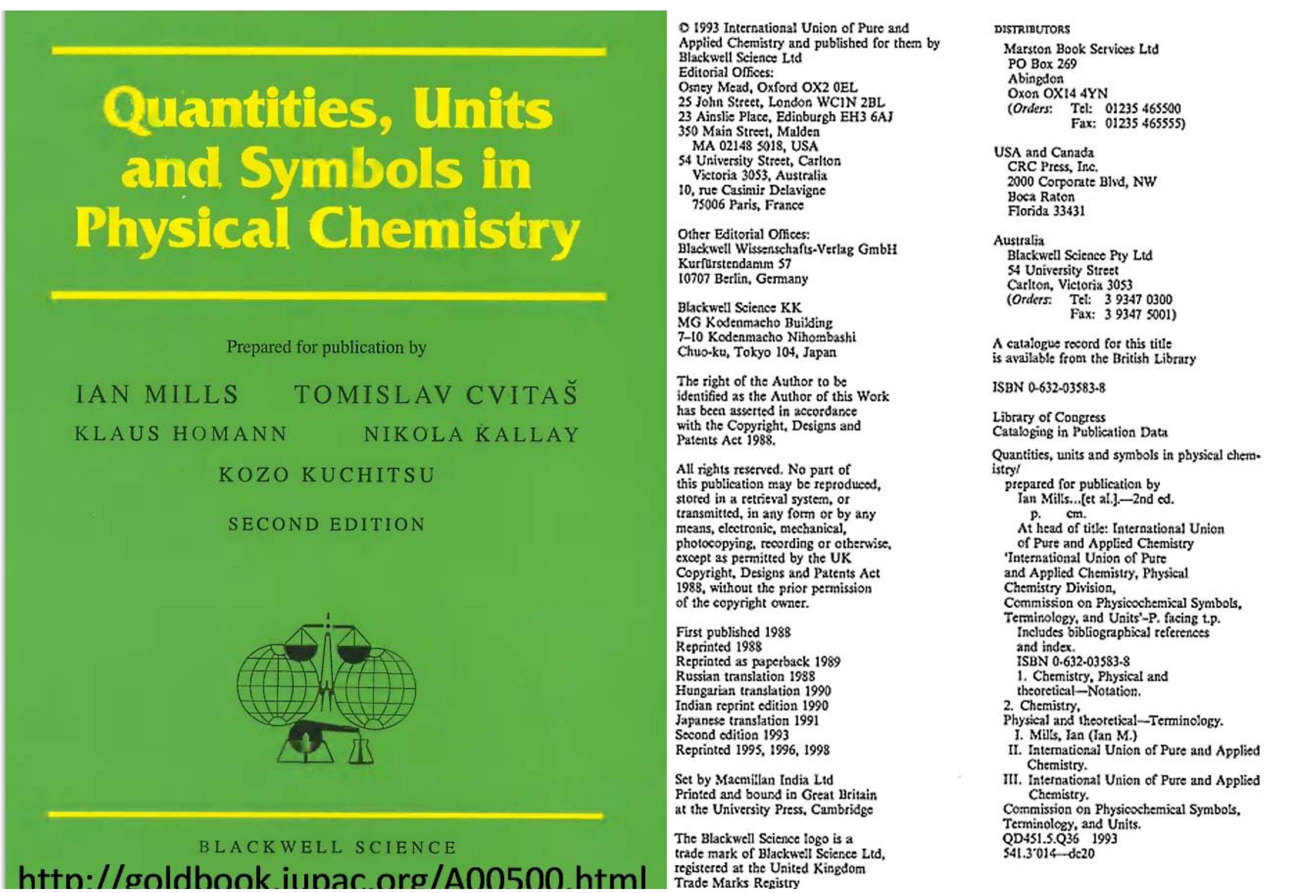
"Quantum theory explains a lot, but in fact it does not bring us one step closer to the secrets of the Old Man, in any case, I am convinced that He does not play dice"

Albert Einstein.

I. Introduction

Introduced by Bohr in the planetary model of the atom, the orbits of electrons, he, without realizing it, himself pushed, moving away from the FOUNDATIONS of Quantization of his FOUNDERS - Planck and Einstein. Fascinated by the mysticism of the solutions of the Schrödinger equation, Bohr replaced his orbits, due to a poor understanding of mathematics [1], with interpretations of the "wave function". So, this mysticism entered their very canonized definition: Atomic orbital (electron orbital) is a one-electron wave function, ψ, obtained by solving the Schrödinger equation for a given atom; is given by the principal n, orbital l and magnetic m - quantum numbers [2].



Quantities, Units and Symbols in Physical Chemistry

Prepared for publication by

IAN MILLS TOMISLAV CVITAŠ

KLAUS HOMANN NIKOLA KALLAY

KOZO KUCHITSU

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But this definition of ORBITAL included in the ABC books, strictly speaking, is not a definition, but is its redefinition, moreover, it is looped, like a snake devouring its own tail. So, the whole explanation of Chemistry by "Quantum Mechanics" is built on the initially false definition [3]. Indeed, this “definition” does not appeal to the known measured waves - to the Heaviside-Maxwell electromagnetic wave quantized by Planck or to the acoustic wave quantized by Einstein, and not to the de Broglie matter wave, albeit somewhat mystical (yet), but experimentally observed, quantization which, as will be shown, gives the resonant orbits of electrons. No, this "definition" appeals to a fundamentally UNOBSERVABLE "wave function". Those. without losing the inherent “meaning”, this “definition” (with the same success and with the same errors) could be rewritten and vice versa: “Wave function is a one-electron atomic orbital (electron orbital)”. But the physicists who gathered in Copenhagen over a bottle of cheap port came up with “their” special name for the “wave function”, in order to somehow tie it to reality, “their own” special name: probability density. But they didn’t tie it tightly - Schrodinger turned out that it could be not only non-zero, but also maximum inside the nucleus! There are other reasons indicating that the “wave function” has nothing to do with the probability density [4]. And in general, it turned out the same as when a reference to the Principle of Causality is simply masked, the reason for something is not understood. If we talk about the probability density, then we must add - WHAT! So the probability density of the kinetic energy of molecules in a gas can also describe a sound wave. The probability density can be compared not only to electromagnetic waves, but also to the static Coulomb-Newton Laws [4], if, in accordance with the principle of Logarithmic Relativity, we compare to it the subparticles that form these fields, and the substructure of the corresponding fields, even if so far unmeasured by us. And for electron orbitals, if we talk about the probability density of the distribution of an electron in an orbit, then we must honestly say - WHAT! What parameter? And do not hide behind the words UNKNOWN WHAT, when the calculations give the maximum "wave" function of the electron inside the nucleus.

So, at the dawn of the last century, the times of Newton, when the Physicist and the Mathematician were in the same vial of Reality, have already passed. And their misunderstanding of some aspects of Classical Physics [5], multiplied by the misunderstanding of the Planck-Einstein QUANTUM, the developers of the "Quantum Theory" hid behind an imaginary unit from the mat. Heaviside's physics, which was also not fully understood, having supplemented the picture for "completeness" with "unobservable zero-point oscillations."

And, thus, they turned the entire “Quantum Mechanics” into a schizophrenic Game of the Mind, cut off from Reality. And now it took a hundred years for the intoxicating “charm” of mysticism in the ELEMENTARY Harmonic Oscillator, which, in fact, was not even strictly analyzed [6], passed and a heavy hangover with “Black Holes” and “Particles of God” set in. Ate to drink, it's better still a good cognac. And on a "sober head" it becomes obvious that the primary quantization of spatial waves in extended media is done correctly - according to the Principles laid down by Planck and Einstein. This determined the progress of the Quantum Theory of Solids. But the "quantum" transition to local fluctuations has not been carefully worked out in the basics. And he, even in the simplest case of the Ideal Harmonic Oscillator, gives mystical ("immeasurable") ZERO vibrations. So both “Secondary Quantization” and Atomic Physics and after them, Quantum Field Theory for a hundred years have been engaged not in correcting the Basic Models [7], but, in fact, in sucking corrections out of the finger, exceeding what the corrections correct.

That is why the really observed DUALISM [8] even of Planck's light quanta, and even more so of de Broglie particles, was actually attributed to mysticism [9, 10], which does not need to be UNDERSTAND, but must be ACCEPTED.

Whereas the first coherent waves arising due to Quantization, into which the packets of de Broglie waves that fill the particle are converted, Nature “invented” in the form of electron orbitals long before people mastered radio waves and invented the maser laser, where the property of Bose particles is manifested be in the same state without limiting their number. And the manifestation of both the Pauli principle and the same property of Bose particles can be easily shown using the example of electron orbitals, but not at all Schrödinger, but the original ones - Bohr. But first, let us show that the opposition of the classical Bohr orbits to quantum physics is far-fetched, simply dictated by the struggle for the priority of the “invention” of the QUANTUM. Bohr or Planck? Half a century later, Pontryagin's dualism of functional sets "reconciled" them. But the canonization of Schrodinger's "shadows", despite the catastrophic discrepancies between calculations based on "shadows" and experiment, prevented us from noticing the difference between the shadow of the Elephant and the Elephant for another half a century.

II. Classic Orbital

It follows from Classical Physics that in the hydrogen atom the centrifugal force acting on the electron is equal to the force of the Coulomb attraction of the electron and the nucleus. So the force acting on an electron in orbit is the centrifugal force

$$F_C = m\omega^2 r = m\frac{v^2}{r} \tag{1}$$

and the force of the Coulomb attraction of the electron to the hydrogen nucleus

$$F_{11} = \frac{e^2}{4\pi\varepsilon_0 r^2} \tag{2}$$

From the equality of these forces acting on an electron in orbit, we obtain the dependence of the electron velocity in orbit on its radius (Fig. 1)

$$m\frac{v^2}{r} = \frac{e^2}{4\pi\varepsilon_0 r^2} \Rightarrow v_1^2 = \frac{e^2}{4\pi\varepsilon_0 r_1 m} \Rightarrow v_1 = \pm\frac{e}{2\sqrt{\pi\varepsilon_0 m}}\frac{1}{r_1^{1/2}} \tag{3}$$

$$\frac{v_1}{c} = \pm\frac{e}{2c\sqrt{r_1\pi\varepsilon_0 m}}\frac{1}{(r/r_1)^{1/2}} = \pm 0.007291686044471947\frac{1}{(r/r_1)^{1/2}} \tag{4}$$

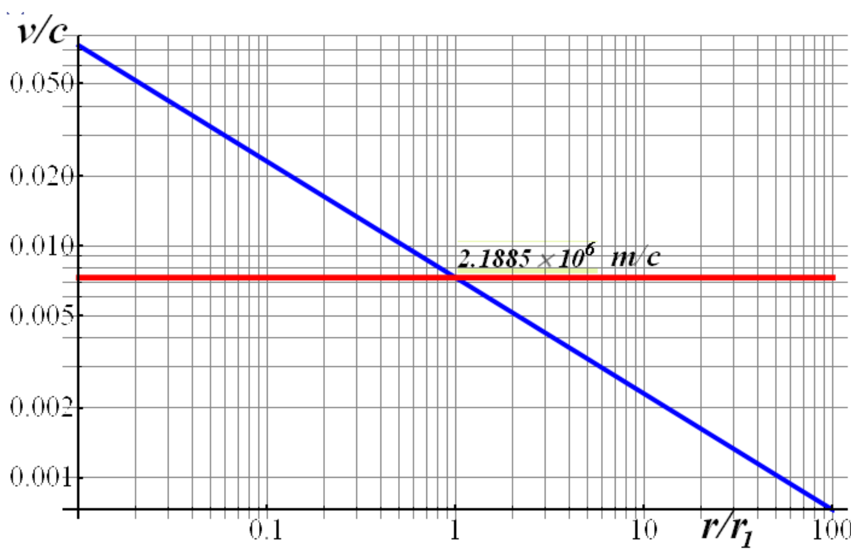

Fig. 1: The dependence of the relative (reduced to the speed of light) velocity of the steady motion of an electron in the orbit of a hydrogen atom on the relative radius of the electron orbit, reduced to its experimental radius (blue line):
$e = -1.60 \cdot 10^{-19}$ C,
$m = 9.11 \cdot 10^{-31}$ kg,
$\varepsilon 0 \approx 8.85\ 10^{-12}$ m^{-3} kg^{-1} s^4 A^2,
$r_1 = 53\ 10^{-12}$ m

The resulting dependence of the electron speed, as well as the speed reduced to the speed of light, are determined not only by world constants, but also by the absolute value of the orbit radius. So, using the tabular value of the size of the hydrogen atom as the diameter of the orbit, we get the red line shown in Fig. 1, a quite reasonable value for the speed of stable rotation of an electron in orbit (the reduced radius is used on the graph). But relatively weak influences can take the electron away from the initially given radius of the classical orbit to neighboring ones.

In this orbit, the potential (Coulomb) energy of an electron, if we set it to zero for an electron at infinity, is equal to

$$U_{11} = \frac{e^2}{4\pi\varepsilon_0 r_1} \tag{5}$$

With the speed obtained in formula 3, the kinetic energy of an electron in this orbit is equal to half the potential:

$$E_C = m\frac{v_1^2}{2} = m\frac{\left(\dfrac{e}{2\sqrt{\pi\varepsilon_0 m}}\dfrac{1}{r_1^{1/2}}\right)^2}{2} = \frac{e^2}{8\pi r_1\varepsilon_0} = \frac{U_{11}}{2} = I_1 \approx 13.55eV \quad (6)$$

and, of course, is also equal, as shown in Fig. 2, to the energy of the electron's exit into vacuum.

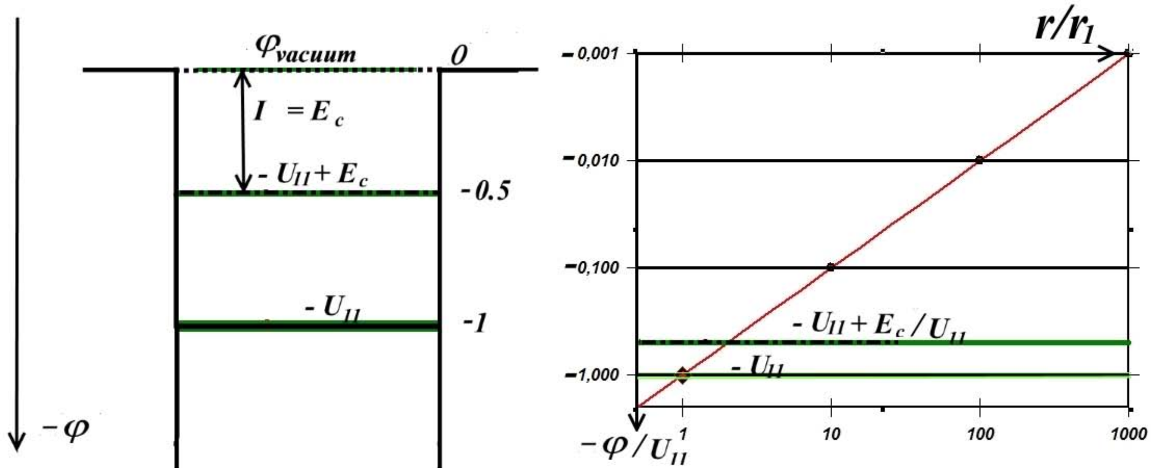

Fig. 2: Electron energy level diagram on a linear scale (left) and on a logarithmic scale (right) the edge of the potential Coulomb well (red line) with exponentially decreasing equipotentials with the electron energy level superimposed on them (green line).

At the same time, the purely classically obtained numerical value of the electron work function (6), which is in good agreement with the tabular value of the Ionization Potential for the hydrogen atom - 13.595 eV.

The whole question is: Why did the electron "choose" from a continuous series of orbits exactly the radius of rotation that corresponds to the Ionization Potential of hydrogen? Although it is likely that the "choice" of this "quantum" radius was simply hidden behind the classical calculation, based on the most experimentally determined value of the Ionization Potential.

So, in the classical representations for the hydrogen atom, as well as in space calculations, we have a continuous series of orbits, with an easy transition from one to another. And the first cosmic velocity for the Earth's satellites is calculated simply on the basis of their minimum radius, equal to the radius of the Earth.

But the "cosmic" velocities of an electron can be tried to be calculated in the model of particle rotation around an infinitely small point. In the simplest particular case - at a fixed speed of rotation of an electron around the nucleus (which, for clarity, we assume equal to unity), the trajectory of its movement relative to the nucleus is described by a modified Archimedes spiral, the radius of which is determined by the ratio of its "start from the nucleus" speed and the total radial acceleration: the balance of the centrifugal forces and forces of the Coulomb attraction of the electron to the nucleus and something else, which gives the binding of the calculated values to the experimentally observed values of the Ionization Potential in the resonant orbit:

$$r(\theta) = v_0 - \frac{a\theta^2}{2} \quad (7)$$

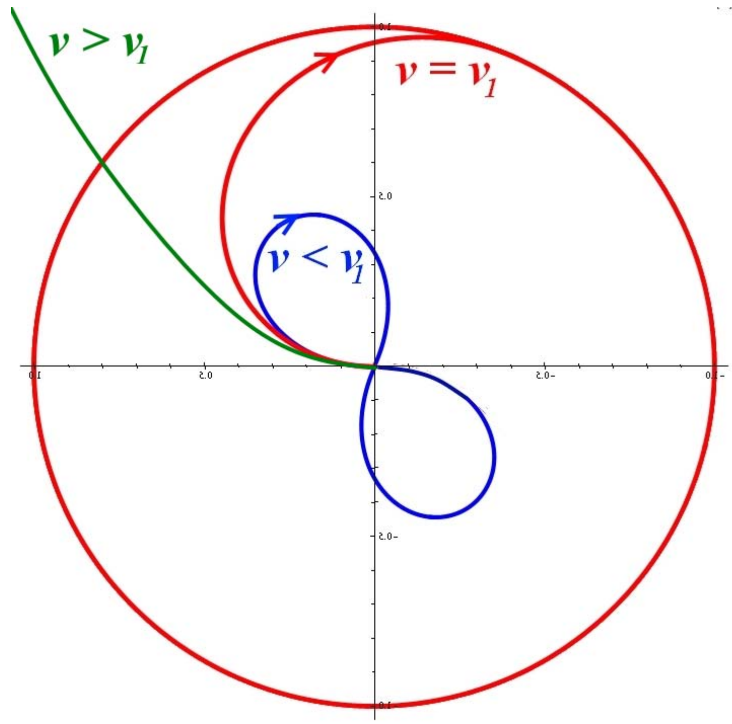

Fig. 3: The trajectories of an electron that "started from the nucleus" at different speeds

As can be seen from Figure 3, the electron at low speeds will return to the center of rotation and (if it can) skip it. It enters a stationary circular orbit at an initial speed equal to the speed of movement along the orbit, which is its “first cosmic speed”. At high starting speeds, the electron also goes into a stationary, but elliptical orbit. And when the “second/third” cosmic velocity is reached, the electron becomes free - it goes to infinity and no longer returns to the nucleus.

We will not carry out this model calculation in detail, since the model with an infinitely small rotation point is idealized and, in accordance with the Principle of Relativity, must also take into account the limitation of the electron speed by the speed of light, while the speed obtained above on the basis of classical concepts is far from the speed of light. But the obtained value for the speed of an electron in a stationary circular orbit (Fig. 1.) is quite real and is “the first space velocity for a hydrogen electron. So the reason for the "quantization" of orbits proposed by Bohr - the stabilization of only a few "selected" orbits from the entire series of orbits - must be sought in something else, and not in the limitation of speed by the Principle of Relativity.

But the value of the speed on the orbit itself was obtained from its radius, which is set equal to the radius of the hydrogen atom (which, of course, is a tautology). And, as will be shown below, the calculation path indicated by Planck gives even without “Schrödinger shadows” not an abstract one, which, as shown in the work, leads to a catastrophic discrepancy between the calculated allowed energy levels and the First Ionization Potentials with an increase in the mass of atoms [11], but a real the value of the "chosen" radius, consistent, as will be shown later, with the experimental values of the Ionization Potentials.

And, thus, Bohr's orbital model of the atom is restored in rights!

III. Quantum Addition to the Classics

From the equality of the forces acting on an electron in orbit, in the classical consideration, similarly to formula 3 (or simply by dividing formula 3 by the radius), we can also obtain the dependence of the frequency of its rotation around the nucleus on the radius

$$m\omega^2 r = \frac{e^2}{4\pi\varepsilon_0 r^2} \Rightarrow \omega_1^2 = \frac{e^2}{4\pi\varepsilon_0 r_1^3 m} \Rightarrow \omega_1 = \frac{e}{2\sqrt{\pi\varepsilon_0 m}}\frac{1}{r_1^{3/2}} \quad (8)$$

And so, the classical consideration gives one functional relationship of either the electron velocity in the orbit, or the rotation frequency with its radius, using the experimental value of which, according to Bohr, we simply postulated their separation from the series as stationary.

Now we use the Planck equation and the Planck constant to relate to the frequency of light equal to the energy of the Ionization Potential, which, according to formula 6, is equal to the kinetic energy of an electron in orbit

$$I_1 = \hbar\omega_{Ph1} = E_C = m\frac{v_1^2}{2} = m\frac{\omega_1^2 r_1^2}{2} \qquad (9)$$

This equation complements the classical ones and, thus, gives an additional connection between the rotation frequency and the radius of the orbit, if the light quantum correlates with the rotation frequency of the electron in orbit. And, thus, if we ASSUME this correlation of frequencies, then it is possible to obtain a single value of both the frequency and the radius of the classical orbit.

In particular, if we assume that these frequencies are equal, then from (9) we obtain, in addition to equation (8), one more equation relating the frequency to the radius.

$$\omega_1 = \frac{2\hbar}{mr_1^2} \qquad (10)$$

And equating the frequencies, we get one equation with one unknown radius:

$$\frac{2\hbar}{mr_1^2} = \frac{e}{2\sqrt{\pi\varepsilon_0 m}}\frac{1}{r_1^{3/2}} \qquad (11)$$

The solution of the resulting equation gives us the only value of the radius of the RESONANT orbit of an electron in the hydrogen atom

$$r_1 = \frac{16\pi\hbar^2\varepsilon_0}{e^2 m} = 212.14\text{pm} \qquad (12)$$

So, the World Constants, supplemented by Planck's constant, uniquely DETERMINE the radius of the RESONANT orbit of an electron in a hydrogen atom. But the obtained value of the radius of the orbit is approximately 4 times larger than the radius of the hydrogen atom obtained from the experiment.

If we assume that the frequency of a light quantum is equal to HALF the frequency of rotation of an electron in orbit, then instead of equations (9-10) we get

$$\hbar\frac{\omega_1}{2} = m\frac{\omega_1^2 r_1^2}{2} \Rightarrow \omega_1 = \frac{\hbar}{mr_1^2} \qquad (13)$$

And instead of equation (11) we have

$$\frac{\hbar}{mr_1^2} = \frac{e}{2\sqrt{\pi\varepsilon_0 m}}\frac{1}{r_1^{3/2}} \qquad (14)$$

And, then, we obtain the expression of the radius of the orbit determined by the World Constants, which gives a value that coincides with the experimental value of the hydrogen radius given under Figure 1 with good accuracy:

$$r_1 = \frac{1}{4}\frac{16\hbar^2\pi\varepsilon_0}{e^2 m} = 53.03\text{pm} \qquad (15)$$

At the same time, taking into account that the particle is an electron, it is a packet of waves, it is natural to assume that the resonant orbit corresponds to a resonant wave. Plasma, resonant, i.e. standing fluctuations in the charge density lead to the formation of charged layers at the boundaries of the resonator. But there are no boundaries in a circular orbit and, consequently, there are no areas of charge accumulation - there is no dipole. Therefore, again, it is natural that this resonance wave does not give a charge to the radiation of an electromagnetic wave. And the dipole arises only between the entirely displaced orbit and the nucleus. So the excitation of the entire electron orbit is PARAMETRIC, as it should be at half the frequency of its intra-orbital resonance!

So, in fact, the rejection of the Bohr orbital model of the atom was incorrectly "justified" by the instability of the (energy) of this electron orbit due to electromagnetic radiation. But, taking into account the corpuscular-wave dualism, the de Broglie wave packet of an electron in a resonant orbit also enters into resonance - in a self-coherent state, i.e. the electron becomes a resonant undamped wave, which, as noted above, does not have a dipole and does not radiate at the resonant frequency.

And taking into account the obtained parametric relationship between the frequencies of rotation of an electron in a resonant orbit and the quantum of light exciting it from the orbit, one can also imagine the parametric relationship of the de Broglie wave with an electromagnetic wave. In this case, the de Broglie wavelength of an electron in a resonant orbit is determined by the circumference of this orbit

$$\lambda_{dB} = 2\pi r_1 = \frac{8\hbar^2\pi^2\varepsilon_0}{e^2 m} \qquad (16)$$

So the ideal (undamped) resonance of the de Broglie wave DOES NOT radiate energy, if the Planck quantum for electromagnetic waves is extended not only to acoustic (as Einstein did), but also to the de Broglie waves of the electron.

IV. Principles of Formation of Multielectron Orbitals

The representation of an electron orbital as a packet of de Broglie waves of an electron transformed into a resonant wave gives a simple explanation for the Pauli principle. Given that orthogonally polarized (charge) waves do not repel each other, it can be assumed that two electron waves can simultaneously be in the same orbit as one particle with doubled mass and doubled charge. This corresponds to the Pauli principle for electrons as particles. Therefore, for this pair of electrons in orbit, the centrifugal force, in contrast to formula (1), is equal to

$$F_C = 2m\omega^2 r = 2m\frac{v^2}{r} \tag{17}$$

And the force of the Coulomb attraction of a pair of electrons in this orbit to a nucleus with a double charge (helium atom) is equal to

$$F_{22} = \frac{e^2}{\pi\varepsilon_0 r^2} \tag{18}$$

From the equality of forces in the orbit of this pair of electrons, similarly to formula (3), but now using the radius of the helium atom 32 10^{-12} m, we obtain a large, but also quite reasonable speed of movement of this pair of electrons along the orbit of the order of a percent from the speed of light

$$v_2{}^2 = \frac{e^2}{2\pi\varepsilon_0 r_2 m} \Rightarrow v_2 = \pm\frac{e}{\sqrt{2\pi\varepsilon_0 m r_2}} = \pm 3978566.4 m/s = \pm 0.0133 \cdot c \tag{19}$$

Wherein. again, the classical consideration gives the first functional relationship between the speed of a pair of electrons in an orbit and its radius and the total potential energy of this pair of electrons

$$U_{22} = \frac{e^2}{\pi\varepsilon_0 r_2} = 179.548356 eV \tag{20}$$

where one electron accounts for half of the potential energy of the pair:

$$U_{21} = \frac{U_{22}}{2} = \frac{e^2}{2\pi\varepsilon_0 r_2} = 89{,}7742 eV \tag{21}$$

At a higher speed in the orbit of a pair of electrons from formula (19), the kinetic energy of a pair of electrons in this orbit naturally also increases, but again it is exactly half of the potential energy of a pair of electrons:

$$E_C = 2m\frac{v_2{}^2}{2} = 2m\frac{\frac{e^2}{2\pi\varepsilon_0 r_2 m}}{2} = \frac{e^2}{2\pi r_2 \varepsilon_0} = U_{21} = I_{22} \tag{22}$$

So the energy diagram for a pair of electrons, and for each electron of this pair, is completely similar to the diagram shown in Fig. 2. And to pull out a pair of electrons from this level, you need eV, which is close to the Total Ionization Energy attributed to helium −79.005151042(40) eV.

And in order to pull out one electron from this orbit, half of this Ionization Energy of the pair is required - 44.8871 eV. But this energy value is almost twice the tabular value of the First Ionization Potential of helium 24.47 eV.

It also follows from the above reasoning that the level of the remaining one electron of the helium atom decreases after primary ionization, and during ionization it needs to additionally overcome the Coulomb force of the nucleus charged by the first ionization. But for the time being, we will not be distracted by these arguments, which may and will help explain the discrepancies in the energy levels of the helium atom, which is more complex than hydrogen. And immediately we will use the quantum addition to the classical calculations of the orbital of a pair of electrons on the basis of its energy diagram obtained.

To do this, first again, from the equality of forces acting on a pair of electrons in orbit, in the classical consideration, we can obtain, similarly to formula (8), in addition to (19), the dependence of the frequency of rotation of this pair around the nucleus on the radius of the pair orbit

$$2m\omega^2 r = \frac{e^2}{\pi\varepsilon_0 r^2} \Rightarrow \omega_2{}^2 = \frac{e^2}{2\pi\varepsilon_0 r_2{}^3 m} \Rightarrow \omega_2 = \frac{e}{\sqrt{2\pi\varepsilon_0 m}}\frac{1}{r_2{}^{3/2}} \tag{23}$$

We use the Planck equation and the Planck constant to relate to the frequency of light, the quantum of which is equal to the energy of the Ionization Potential and which, according to formula (22), is equal to the kinetic energy of a pair of electrons in orbit

$$I_{22} = \hbar\omega_{Ph2} = E_{C2} = 2m\frac{v_2{}^2}{2} = m\omega_2{}^2 r_2{}^2 \tag{24}$$

This equation complements the classical ones and, thus, gives an additional connection between the rotation frequency and the radius of the orbit. And, thus, if we ASSUME that the frequency of a light quantum correlates with the frequency of light, it makes it possible to obtain a single value of both the frequency and the radius of the classical orbit.

In particular, if these frequencies are equal, then we obtain, in addition to equation 8, another equation relating the frequency to the radius.

$$\omega_2 = \frac{\hbar}{m{r_2}^2} \tag{25}$$

And equating the frequencies, we again get one equation with one unknown radius:

$$\frac{\hbar}{m{r_2}^2} = \frac{e}{\sqrt{2\pi\varepsilon_0 m}} \frac{1}{{r_2}^{3/2}} \tag{26}$$

The solution of the obtained equation gives us the only value of the radius of the RESONANT orbit of a pair of electrons in a helium atom, which is 8 times less than the radius of an electron orbit in hydrogen

$$\frac{\hbar}{e}\sqrt{\frac{2\pi\varepsilon_0}{m}} = {r_2}^{1/2} \Rightarrow r_2 = \frac{2\pi\varepsilon_0\hbar^2}{me^2} = \frac{1}{8}r_1 = 26.52\text{pm} \tag{27}$$

This one, obtained from the World Constants, with equal frequencies of light and rotation of a pair of electrons per orbit, e, the radius of the circular orbit of rotation of a pair of electrons 26.52 pm is close to the radius of helium 32 pm. Consequently, the parametric coupling is weaker, and, as already noted, the dipole of electron waves does not appear on the orbit. Therefore, the excitation of the entire pair of electrons is unlikely. But we will not be special consideration of the Second Ionization Potentials in this work. We simply note that the use of the quasi-nuclear model for a completely filled shell of a pair of electrons makes it possible, even with an increase in the atomic number, to estimate from the first principles both the radius of the additional electron shell and the energy level corresponding to it, as approximately equal to their values in the hydrogen atom. This numerically differs from the experimental values by tens of percent (Fig. 4, blue dotted lines), which is natural in the first approximation by the quasi-nuclear model, which does not take into account the repulsion of the upper electron by the filled inner shell. But even these discrepancies, which can be seen how to eliminate, are not catastrophic, by orders of magnitude, which gives the Schrödinger equation [3, 11].

The quasi-nuclear model with the calculation algorithm described above gives a significant jump in the size of the atom and its First Ionization Potential even when one more electron is added to the completely filled named c-shell. And here there is a relatively small change in the atomic number and radius of the orbit of the added outer electron, and its First Ionization Potential (Fig. 4, red dotted lines). But for a more rigorous calculation than the quasi-nuclear model, according to the described algorithm, of course, it is necessary to take into account the symmetry of the tetrahedron of electron shells when the c-shell is completely filled for the second and third periods, and their even more complex symmetry for the following periods, which manifests itself during the transition from - shells to the so-called p-shell (green dotted curves in Fig. 4), where the equivalent orbitals form, as previously shown, a tetrahedron.

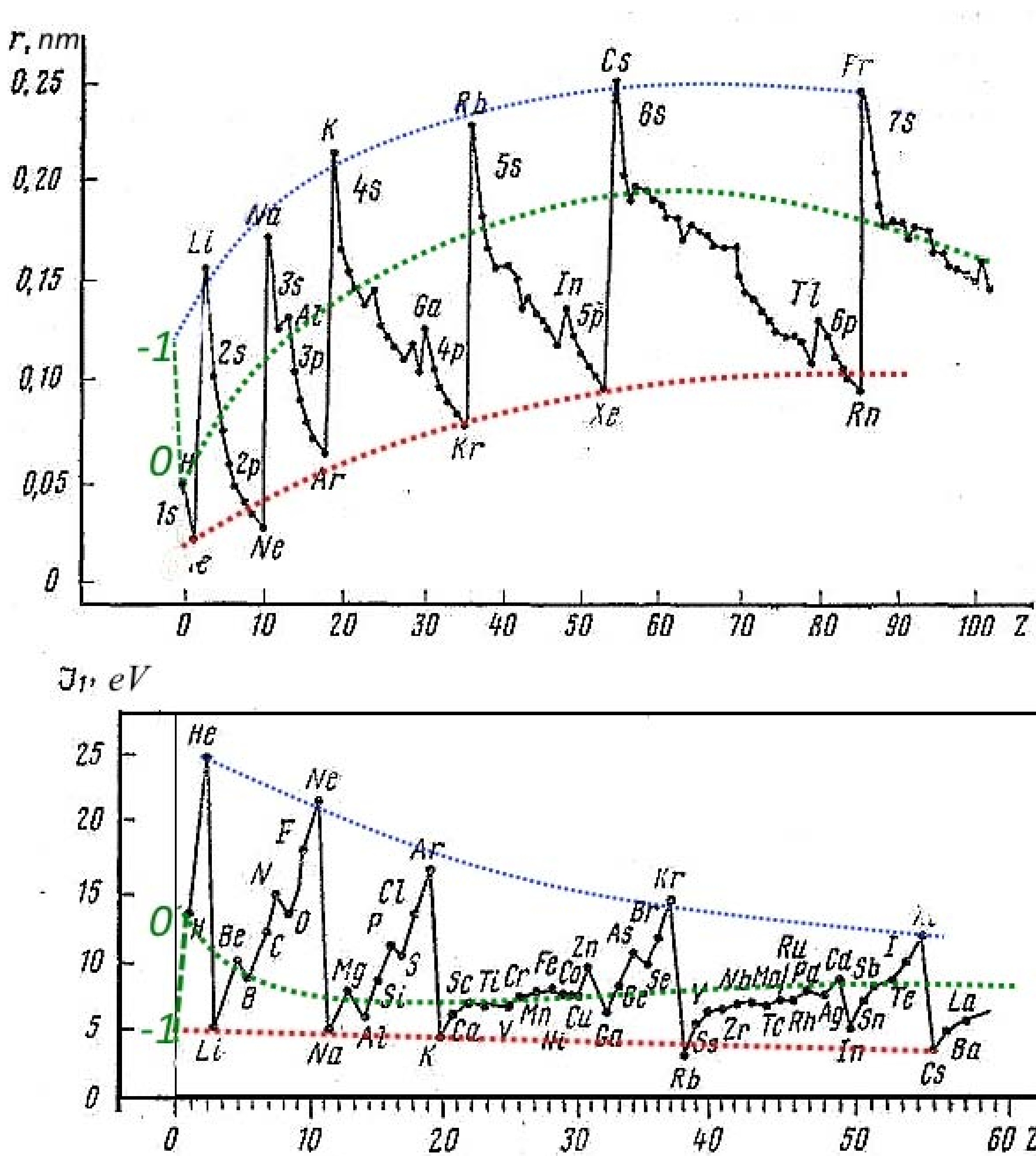

Fig. 4: Dependence of the radius of the outer electron shell and its First Ionization Potential on the atomic number (Zero denotes the "zero" element used in the construction of the periodic table by Mendeleev, and minus one is an additional conditional element with minus one electron)

And so, as it should be, correctly chosen Basic Models give/describe the correct order of observed phenomena, in contrast to erroneous, but Canonized Models, which give catastrophic discrepancies with experiment and are suitable only for decoration and deception of the layman.

And the algorithm described in this paper makes it possible to obtain the "Second" Principle from the First Principles - how all electron orbitals and their corresponding levels of allowed energies are formed in an atom with any atomic number:

The deepest orbital and its energy level, the deepest, are formed in the Coulomb field of the nucleus of the field from the maximum number of equivalent orbitals satisfying point spatial symmetry (this number of electrons of the inner shell is less than or equal to the total number of electrons of the atom).

The remainder of the total number of electrons, in turn, is divided by the maximum number of electrons for reduced symmetry, which form the next higher allowed energy level.

So, in a recurrent way, using the quasi-nuclear model, it is possible to calculate from first principles - from bottom to top, all the electronic levels of different atoms, from an atom with a completely filled electron shell to atoms by filling a new shell with electrons with a quasi-nucleus from the nucleus and the last fully filled shell. Only for a quantitatively rigorous calculation it is necessary to take into account the degree of screening of the nucleus by deeper filled shells, which, of course, is higher for the lowest shell and is enhanced by subsequent overlying shells and is minimal for the upper shell from one orbit with two electrons.

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Macroscopic Effect of Quantum Gravity in General Static Isotropic Gravitational Field

By Gang Lee

Abstract- In this paper we calculated the self-interaction of the gravitational field, and analyzed the effect of the self-interactions in a general static isotropic gravitational field using a semi classical approach. We found that the effects of the self - interaction in the gravitational field can be used to explain dark matter.

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I. Introduction

This paper discusses the effects of self-interaction of gravitational field and finds that it can be used to explain dark matter. In section 2, we calculated the self-interaction of the gravitational field. We analyzed the effect of the self-interaction of a general static isotropic gravitational field using a semi classical approach. In section 3, we found a symmetry of the Klein-Gordon equation in the noncommutative quantum gravitational field.

II. Noncommutative Quantum Gravity and Self Interaction

Let's briefly review the theory of noncommutative quantum gravity while referring to [1] for more details.

Since the introduction of the uncertainty principle into the general theory of relativity, we get a semiclassical graviton approximate to the Dirac δ-function as follows

$$\xi^\alpha(x, X) = X + C^\alpha(x) \cdot \exp(-\left|\frac{X}{L_P(x)}\right|) \tag{2.1}$$

The free field equation is

$$\partial^\mu \partial_\mu \xi^\alpha(x) = 0 \tag{2.2}$$

At the point x, the local inertial coordinate is $\xi^\alpha(x, X)\big|_{X=0}$. Then the metric associated with ξ^α is

$$\begin{aligned} g_{\mu\nu}(x) &= \frac{\left(\partial \xi^\alpha\big|_{X=0}\right)}{\partial x^\mu} \frac{\partial\left(\xi^\beta\big|_{X=0}\right)}{\partial x^\nu} \eta_{\alpha\beta} \\ &= \frac{\partial C^\alpha(x)}{\partial x^\mu} \frac{\partial C^\beta(x)}{\partial x^\nu} \eta_{\alpha\beta} \end{aligned} \tag{2.3}$$

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In any point x of gravitational field, due to the ductility of gravitons, gravitons elsewhere will act on the point x together. all another gravitons excited at a distance of $l \equiv l^\mu$ from point x can be written as

$$\begin{aligned}\Delta\xi^\alpha =& X + \int d^4 l\, \xi^\alpha\big((x+l), |l|\big) \\ =& X + \int d^4 l \left(C^\alpha(x+l)\cdot \exp(-\left|\frac{l}{L_P(x+l)}\right|)\right)\end{aligned} \tag{2.4}$$

Then after considering the effects of all gravitons, the locally inertial coordinate system ξ^α at point x have to written as

$$\lambda(\xi^\alpha) = \xi^\alpha(x,X)\big|_{X=0} + \Delta\xi^\alpha \tag{2.5}$$

The field $C^\alpha(x+l)$ also satisfy the free field equation, it can be written as

$$\begin{aligned}C^\alpha(x+l) =& \int d^4 k \left(C^\alpha(k)\exp\big(ik(x+l)\big) + (C^\alpha(k))^* \exp\big(-ik(x+l)\big)\right) \\ =& \int d^4 k \left(C^\alpha(k)\exp(ikx)\exp(ikl) + (C^\alpha(k))^* \exp(-ikx)\exp(-ikl)\right)\end{aligned} \tag{2.6}$$

Then we have

$$\begin{aligned}\frac{\partial\Delta(\xi^\alpha)}{\partial x^\mu} =& \frac{\partial \int d^4 l \left(C^\alpha(x+l)\cdot\exp(-\left|\frac{l}{L_P(x+l)}\right|)\right)}{\partial x^\mu} \\ =& \int d^4 k d^4 l \Big[\Big(ik_\mu C^\alpha(k)\exp(ikx)\exp(ikl) \\ & - ik_\mu\,(C^\alpha(k))^* \exp(-ikx)\exp(-ikl)\Big)\cdot \exp(-\left|\frac{l}{L_P(k)}\right|)\Big] \\ =& \int d^4 k \left(\frac{2|L_P|}{1-ikL_P} ik_\mu C^\alpha(k)\exp(ikx) - \frac{2|L_P|}{1+ikL_P} ik_\mu\,(C^\alpha(k))^* \exp(-ikx)\right)\end{aligned} \tag{2.7}$$

In momentum space, the metric with the self-interaction can be written as follows

$$
\begin{aligned}
g_{\mu\nu}[\lambda(\xi)] &= \frac{\partial\lambda(\xi^{\alpha})}{\partial x^{\mu}}\frac{\partial\lambda(\xi^{\beta})}{\partial x^{\nu}}\eta_{\alpha\beta} \\
&= \frac{\partial\left(\xi^{\alpha}(x,X)\big|_{X=0}+\Delta\xi^{\alpha}\right)}{\partial x^{\mu}}\frac{\partial\left(\xi^{\beta}(x,X)\big|_{X=0}+\Delta\xi^{\beta}\right)}{\partial x^{\nu}}\eta_{\alpha\beta} \\
&\equiv g_{\mu\nu}[\,\xi\,]+g^{(1)}_{\mu\nu}+g^{(2)}_{\mu\nu}
\end{aligned}
\tag{2.8}
$$

By Eq.(2.7) we get

$$
\begin{aligned}
g_{\mu\nu}[\xi] = \Bigg[\int d^4k\left(ik_{\mu}C^{\alpha}(k)\exp(ikx) - ik_{\mu}\left(C^{\alpha}(k)\right)^{*}\exp(-ikx)\right) \\
\cdot\int d^4k\left(ik_{\nu}C^{\beta}(k)\exp(ikx) - ik_{\nu}\left(C^{\beta}(k)\right)^{*}\exp(-ikx)\right)\Bigg]\cdot\eta_{\alpha\beta}
\end{aligned}
\tag{2.9}
$$

$$
\begin{aligned}
g^{(1)}_{\mu\nu} = 2\cdot\Bigg[\int d^4k\left(\frac{2|L_P(k)|}{1+ikL_P(k)}ik_{\mu}C^{\alpha}(k)\exp(ikx) - \frac{2|L_P(k)|}{1-ikL_P(k)}ik_{\mu}\left(C^{\alpha}(k)\right)^{*}\exp(-ikx)\right) \\
\cdot\int d^4k\left(ik_{\nu}C^{\beta}(k)\exp(ikx) - ik_{\nu}\left(C^{\beta}(k)\right)^{*}\exp(-ikx)\right)\Bigg]\cdot\eta_{\alpha\beta}
\end{aligned}
\tag{2.10}
$$

$$
\begin{aligned}
g^{(2)}_{\mu\nu} = \Bigg[\int d^4k\left(\frac{2|L_P(k)|}{1+ikL_P(k)}ik_{\mu}C^{\alpha}(k)\exp(ikx) - \frac{2|L_P(k)|}{1-ikL_P(k)}ik_{\mu}\left(C^{\alpha}(k)\right)^{*}\exp(-ikx)\right) \\
\cdot\int d^4k\left(\frac{2|L_P(k)|}{1+ikL_P(k)}ik_{\nu}C^{\beta}(k)\exp(ikx) - \frac{2|L_P(k)|}{1-ikL_P(k)}ik_{\nu}\left(C^{\beta}(k)\right)^{*}\exp(-ikx)\right)\Bigg]\cdot\eta_{\alpha\beta}
\end{aligned}
\tag{2.11}
$$

Denote

$$
f(k)\equiv\frac{2|L_P(k)|}{1+ik_{\mu}L_P(k)},\quad f^{*}(k)\equiv\frac{2|L_P(k)|}{1-ik_{\mu}L_P(k)}
\tag{2.12}
$$

Using the mean value theorem of definite integrals, we have

$$
\begin{aligned}
g^{(1)}_{\mu\nu} = 2\cdot\left[\int d^4k\left(f(k)\cdot ik_{\mu}C^{\alpha}(k)\exp(ikx)\right) - d^4k\left(f^{*}(k)\cdot ik_{\mu}\left(C^{\alpha}(k)\right)^{*}\exp(-ikx)\right)\right] \\
\cdot\left[\int d^4k\left(ik_{\nu}C^{\beta}(k)\exp(ikx) - ik_{\nu}\left(C^{\beta}(k)\right)^{*}\exp(-ikx)\right)\right]\cdot\eta_{\alpha\beta}
\end{aligned}
$$

$$= 2 \cdot \left[f(\zeta_r) \cdot \int d^4k \left(ik_\mu C^\alpha(k) \exp(ikx) \right) - f^*(\zeta_r^*) \cdot \int d^4k \left(ik_\mu \left(C^\alpha(k) \right)^* \exp(-ikx) \right) \right)$$

$$\cdot \int d^4k \left(ik_\nu C^\beta(k) \exp(ikx) - ik_\nu \left(C^\beta(k) \right)^* \exp(-ikx) \right) \Big] \cdot \eta_{\alpha\beta} \tag{2.13}$$

$$g_{\mu\nu}^{(2)} = \left[\int d^4k \left(f(k) \cdot ik_\mu C^\alpha(k) \exp(ikx) \right) - d^4k \left(f^*(k) \cdot ik_\mu \left(C^\alpha(k) \right)^* \exp(-ikx) \right) \right]$$

$$\cdot \left[\int d^4k \left(f(k) \cdot ik_\mu C^\beta(k) \exp(ikx) \right) - d^4k \left(f^*(k) \cdot ik_\mu \left(C^\beta(k) \right)^* \exp(-ikx) \right) \right] \cdot \eta_{\alpha\beta} \tag{2.14}$$

$$= \left[f^*(\zeta_r) \cdot \int d^4k \left(ik_\mu C^\alpha(k) \exp(ikx) \right) - f^*(\zeta_r^*) \cdot \int d^4k \left(ik_\mu \left(C^\alpha(k) \right)^* \exp(-ikx) \right) \right]$$

$$\cdot \left[f(\zeta_r) \cdot \int d^4k \left(ik_\mu C^\beta(k) \exp(ikx) \right) - f^*(\zeta_r^*) \cdot \int d^4k \left(ik_\mu \left(C^\beta(k) \right)^* \exp(-ikx) \right) \right] \cdot \eta_{\alpha\beta}$$

where $f(\zeta)$ is the mean value of $f(k)$, $f^*(\zeta^*)$ is the mean value of $f^*(k)$.

Now we found the self-interaction $g_{\mu\nu}^{(1)} + g_{\mu\nu}^{(2)}$ of the noncommutative quantum gravity.

Let's discuss a macroscopic system by a semi classical approach, the case of a general static isotropic gravitational field. The general static isotropic metric is:

$$ds^2 = g_{rr}dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2 - g_{tt}dt^2$$

$$g_{rr} = \left[1 - \frac{2MG}{r} \right]^{-1}, \quad g_{tt} = \left[1 - \frac{2MG}{r} \right] \tag{2.15}$$

We can also express it in the equivalent isotropic form, by introducing a new radius variable ρ

$$\rho \equiv \frac{1}{2} \left[r - MG + (r^2 - 2mGr)^{1/2} \right] \tag{2.16}$$

or

$$r = \rho \left(1 + \frac{MG}{2\rho} \right)^2 \tag{2.17}$$

Substituting it into Eq.(2.15) gives the isotropic form as follows

$$ds^2 = \left(1 - \frac{MG}{2\rho}\right)^4 \left(d\rho^2 + \rho^2 d\theta^2 + \rho^2 \sin^2\theta d\phi^2\right) - \left(\frac{(1 - MG/2\rho)^2}{(1 + MG/2\rho)^2}\right) dt^2 \quad (2.18)$$

Compare Eq.(2.9) and Eq.(2.15), we can obtain that the element g_{rr} is

$$g_{rr}[\xi] = \left[\int d^4k \left(ik_r C^\alpha(k)\exp(ikx) - ik_r\left(C^\alpha(k)\right)^* \exp(-ikx)\right)\right.$$
$$\left.\cdot \int d^4k \left(ik_r C^\beta(k)\exp(ikx) - ik_r\left(C^\beta(k)\right)^* \exp(-ikx)\right)\right] \cdot \eta_{\alpha\beta} \quad (2.19)$$
$$= \left[1 - \frac{2MG}{r}\right]^{-1}$$

Then for the element $g_{rr}[\xi]$ of the general static isotropic metric, we have

$$\int d^4k \left(ik_r C^\alpha(k)\exp(ikx)\right) = \int d^4k \left(-ik_r\left(C^\alpha(k)\right)^* \exp(-ikx)\right)$$
$$= \frac{1}{2}\left[1 - \frac{2MG}{r}\right]^{-1/2} \quad (2.20)$$

Denote

$$f(k) \equiv \frac{2|L_P(k)|}{1 + ikL_P(k)}, \qquad f^*(k) \equiv \frac{2|L_P(k)|}{1 - ikL_P(k)} \quad (2.21)$$

Using the mean value theorem of definite integrals, we have

$$\int d^4k \left(f(k) \cdot ik_r C^\alpha(k)\exp(ikx)\right)$$
$$= f(\zeta_r)\int d^4k \left(ik_r C^\alpha(k)\exp(ikx)\right) \quad (2.22)$$
$$= f(\zeta_r) \cdot \frac{1}{2}\left[1 - \frac{2MG}{r}\right]^{-1/2}$$

$$\int d^4k \left(f^*(k) \cdot \left(-ik_r \left(C^\alpha(k)\right)^* \exp(-ikx) \right) \right)$$

$$= f(\zeta_r^*) \int d^4k \left(-ik_r \left(C^\alpha(k)\right)^* \exp(-ikx) \right) \tag{2.23}$$

$$= f^*(\zeta_r^*) \cdot \frac{1}{2} \left[1 - \frac{2MG}{r} \right]^{-1/2}$$

Then $g_{rr}^{(1)}$ is

$$g_{rr}^{(1)} = 2 \cdot \left[\int d^4k \left(\frac{2|L_P(k)|}{1 + ik_r L_P(k)} ik_r C^\alpha(k) \exp(ikx) - \frac{2|L_P(k)|}{1 - ik_r L_P(k)} ik_r \left(C^\alpha(k)\right)^* \exp(-ikx) \right) \right.$$

$$\left. \cdot \int d^4k \left(ik_r C^\beta(k) \exp(ikx) - ik_r \left(C^\beta(k)\right)^* \exp(-ikx) \right) \right] \cdot \eta_{\alpha\beta}$$

$$= 2 \cdot \left[f(\zeta_r) \cdot \frac{1}{2} \left[1 - \frac{2MG}{r} \right]^{-1/2} + f^*(\zeta_r^*) \cdot \frac{1}{2} \left[1 - \frac{2MG}{r} \right]^{-1/2} \right] \cdot \left[1 - \frac{2MG}{r} \right]^{-1/2} \tag{2.24}$$

$$= \left(f(\zeta_r) + f^*(\zeta_r^*) \right) \cdot \left[1 - \frac{2MG}{r} \right]^{-1}$$

And $g_{rr}^{(2)}$ is

$$g_{rr}^{(2)} = \left[\int d^4k \left(\frac{2|L_P(k)|}{1 + ikL_P(k)} ik_r C^\alpha(k) \exp(ikx) - \frac{2|L_P(k)|}{1 - ikL_P(k)} ik_r \left(C^\alpha(k)\right)^* \exp(-ikx) \right) \right.$$

$$\left. \cdot \int d^4k \left(\frac{2|L_P(k)|}{1 + ikL_P(k)} ik_r C^\beta(k) \exp(ikx) - \frac{2|L_P(k)|}{1 - ikL_P(k)} ik_r \left(C^\beta(k)\right)^* \exp(-ikx) \right) \right] \cdot \eta_{\alpha\beta}$$

$$= \left[f(\zeta_r) \cdot \frac{1}{2} \left[1 - \frac{2MG}{r} \right]^{-1/2} + f^*(\zeta_r^*) \cdot \frac{1}{2} \left[1 - \frac{2MG}{r} \right]^{-1/2} \right]^2 \tag{2.25}$$

$$= \left(\frac{f(\zeta_r) + f^*(\zeta_r^*)}{2} \right)^2 \cdot \left[1 - \frac{2MG}{r} \right]^{-1}$$

Denote the true metric $\mathrm{g}_{\mu\nu} \equiv g_{\mu\nu} + g^{(1)}_{\mu\nu} + g^{(2)}_{\mu\nu}$ for short. The element g_{rr} of the true general static isotropic metric can be written as follows

$$\mathrm{g}_{rr} = \left(1 + \frac{f(\zeta_r) + f(\zeta_r^*)}{2}\right)^2 \cdot \left[1 - \frac{2MG}{r}\right]^{-1} \tag{2.26}$$

And g_{tt} is

$$\mathrm{g}_{tt} = \left(1 + \frac{f(\zeta_t) + f(\zeta_t^*)}{2}\right)^2 \cdot \left[1 - \frac{2MG}{r}\right] \tag{2.27}$$

Due to the general static isotropic gravitational field, we have

$$\mathrm{g}_{\theta\theta} = r^2, \quad \mathrm{g}_{\phi\phi} = r^2 \sin\theta \tag{2.28}$$

Denote

$$\Delta_r \equiv \frac{f(\zeta_r) + f(\zeta_r^*)}{2}, \qquad \Delta_t \equiv \frac{f(\zeta_t) + f(\zeta_t^*)}{2} \tag{2.29}$$

Then the true metric $\mathrm{g}_{\mu\nu}$ can be written as

$$\begin{aligned} ds^2 = (1 + \Delta_r)^2 \cdot \left[1 - \frac{2MG}{r}\right]^{-1} dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2 \\ - (1 + \Delta_t)^2 \cdot \left[1 - \frac{2MG}{r}\right] dt^2 \end{aligned} \tag{2.30}$$

We can also express the true metric $\mathrm{g}_{\mu\nu}$ in the equivalent isotropic form, by introducing a new radius variable ρ

$$\rho \equiv \frac{1}{2}\left[\ (1 + \Delta_r)^{-1} \cdot r - MG + \left((1 + \Delta_r)^{-2} \cdot r^2 - 2MG\,(1 + \Delta_r)^{-1} \cdot r\right)^{1/2}\ \right] \tag{2.31}$$

or

$$r = \rho\,(1 + \Delta_r)\left(1 + \frac{MG}{2\rho}\right)^2 \tag{2.32}$$

Substituting it into Eq.(2.15) gives the isotropic form as follows

$$\begin{aligned} ds^2 = (1 + \Delta_r)^2 \cdot \left(1 - \frac{MG}{2\rho}\right)^4 \left(d\rho^2 + \rho^2 d\theta^2 + \rho^2 \sin^2\theta d\phi^2\right) \\ - (1 + \Delta_t)^2 \cdot \left(\frac{1 - MG/2\rho}{1 + MG/2\rho}\right)^2 dt^2 \end{aligned} \tag{2.33}$$

Compare with the metric $g_{\mu\nu}$ (2.15) or (2.18), due to the self-interaction, the spacetime described by the true metric $\mathrm{g}_{\mu\nu}$ has been expanded compared to the space described by metric $g_{\mu\nu}[\xi]$. The radius has expanded to $1+\Delta_r$ times. Because the boundary condition is determined by the same gravitational field equation, from the view point of gravity, the extended spacetime described by the true metric $\mathrm{g}_{\mu\nu}$ is equivalent to the spacetime described by the metric $g_{\mu\nu}[\xi]$. The spacetime described by the metric $g_{\mu\nu}[\xi]$ follows the inverse square law, therefore the gravity of the extended spacetime is stronger than what is given by the inverse square law. In the spacetime described by the true metric $\mathrm{g}_{\mu\nu}$, the gravity at a distance of $\left(1+\Delta_r\right)\cdot r$ from the gravitational source is equal to the gravity of the inverse square law at a distance of r from the gravitational source. It is not modified on the inverse square law, because the boundary condition still determined by the Einstein's field equation.

The mean value Δ_r is related to the boundary condition determined by the Einstein's field equation. In the general static isotropic gravitational field, the only parameter is the mass M of the gravitational source. We can expect that the stronger the gravitational source, the stronger the energy-momentum k of the excited gravitons, and the larger the median value Δ_r. So that if the galaxy with strong enough gravitational source is large enough, the distance from the gravitational source is far enough, the deviation from the inverse square law can be observed.

The self-interaction of the gravitational field also changes the energy-momentum tensor of the gravitational field itself. Let's briefly explain. From the canonical field theory, the energy-momentum tensor of the gravitational field itself is

$$\begin{aligned} t_{\mu\nu}(x) &= -\frac{\eta_{\mu\nu}}{2}\partial^\kappa\lambda(\xi^\alpha)\partial_\kappa\lambda(\xi^\beta)\eta_{\alpha\beta}+\partial_\mu\lambda(\xi^\alpha)\partial_\nu\lambda(\xi^\beta)\eta_{\alpha\beta} \\ &= -\frac{\eta_{\mu\nu}}{2}\partial^\kappa\left(\xi^\alpha\big|_{X=0}+\Delta\xi^\alpha\right)\partial_\kappa\left(\xi^\beta\big|_{X=0}+\Delta\xi^\beta\right)\eta_{\alpha\beta} \\ &\quad +\partial_\mu\left(\xi^\alpha\big|_{X=0}+\Delta\xi^\alpha\right)\partial_\nu\left(\xi^\beta\big|_{X=0}+\Delta\xi^\beta\right)\eta_{\alpha\beta} \end{aligned} \tag{2.34}$$

(We drop the subscript $X=0$ from now on.) It can be written as the classical part $t_{\mu\nu}(\xi)$ and the quantum part $t_{\mu\nu}(\Delta\xi)$

$$t_{\mu\nu}(x)\equiv t_{\mu\nu}(\xi)+t_{\mu\nu}(\Delta\xi) \tag{2.35}$$

The classical part $t_{\mu\nu}(\xi)$ is

$$t_{\mu\nu}(\xi) = -\frac{\eta_{\mu\nu}}{2}\partial^\kappa\xi^\alpha\partial_\kappa\xi^\beta\eta_{\alpha\beta}+\partial_\mu\xi^\alpha\partial_\nu\xi^\beta\eta_{\alpha\beta} \tag{2.36}$$

The energy-momentum tensor of gravitational field itself in the general theory of relativity is

$$t_{\mu\nu} = \frac{1}{8\pi G}\left(\frac{1}{2}\eta_{\mu\nu}R^{(1)}-R^{(1)}_{\mu\nu}\right) \tag{2.37}$$

In the paper[1], we have proven that it is equivalent to the classical part of energy-momentum tensor (2.36).

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The quantum part $t_{\mu\nu}(\Delta\xi)$ is

$$t_{\mu\nu}(\Delta\xi) = -\frac{\eta_{\mu\nu}}{2}\Big[\partial^\kappa\xi^\alpha\partial_\kappa(\Delta\xi^\beta) + \partial^\kappa(\Delta\xi^\alpha)\partial_\kappa\xi^\beta + \partial^\kappa(\Delta\xi^\alpha)\partial_\kappa(\Delta\xi^\beta)\Big]\eta_{\alpha\beta} + \Big[\partial_\mu\xi^\alpha\partial_\nu(\Delta\xi^\beta) + \partial_\mu(\Delta\xi^\alpha)\partial_\nu\xi^\beta + \partial_\mu(\Delta\xi^\alpha)\partial_\nu(\Delta\xi^\beta)\Big]\eta_{\alpha\beta} \tag{2.38}$$

It can be written as

$$t_{\mu\nu}(\Delta\xi) \equiv t^{(1)}_{\mu\nu} + t^{(2)}_{\mu\nu} \tag{2.39}$$

where

$$\begin{aligned} t^{(1)}_{\mu\nu} &= -\frac{\eta_{\mu\nu}}{2}\Big[\partial^\kappa\xi^\alpha\partial_\kappa(\Delta\xi^\beta) + \partial^\kappa(\Delta\xi^\alpha)\partial_\kappa\xi^\beta\Big]\eta_{\alpha\beta} \\ &\quad + \Big[\partial_\mu\xi^\alpha\partial_\nu(\Delta\xi^\beta) + \partial_\mu(\Delta\xi^\alpha)\partial_\nu\xi^\beta\Big]\eta_{\alpha\beta} \\ t^{(2)}_{\mu\nu} &= -\frac{\eta_{\mu\nu}}{2}\partial^\kappa(\Delta\xi^\alpha)\partial_\kappa(\Delta\xi^\beta)\eta_{\alpha\beta} + \partial_\mu(\Delta\xi^\alpha)\partial_\nu(\Delta\xi^\beta)\eta_{\alpha\beta} \end{aligned} \tag{2.40}$$

The quantum part is the change in energy-momentum tensor caused by the self-interaction of the gravitational field.

III. Symmetry of Klein-Gordon Equation

Due to the fact that the graviton ξ^α satisfies the free field equation, and the free field equation is a wave equation, then the field $C^\alpha(x)$ can be expanded as a linear superposition of the form:

$$C^\alpha(x) = C^\alpha(k)\exp\big(ikx\big) + (C^\alpha(k))^*\exp\big(-ikx\big) \tag{3.1}$$

From this property, we can find a symmetry of the Klein-Gordon equation.

In the gravitational field with metric $g_{\mu\nu}$, the Lagrangian density of real scalar particle with spin 0 is

$$\mathscr{L} = g^{\mu\nu}\partial_\mu\Phi\partial_\nu\Phi + m^2\phi^2 \tag{3.2}$$

We can obtain the Klein-Gordon equation in the gravitational field as follows

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^\mu}\left(\sqrt{-g}g^{\mu\nu}\frac{\partial\Phi}{\partial x^\nu}\right) - m^2\Phi = 0 \tag{3.3}$$

It can be written as

$$g^{\mu\nu}\frac{\partial^2\Phi}{\partial x^\mu\partial x^\nu} + \frac{1}{2g}\frac{\partial g}{\partial x^\mu}g^{-1}_{\mu\nu}\frac{\partial\Phi}{\partial x^\nu} - g^{-1}_{\mu\nu}\frac{\partial g_{\mu\nu}}{\partial x^\mu}g^{-1}_{\mu\nu}\frac{\partial\Phi}{\partial x^\nu} - m^2\Phi = 0 \tag{3.4}$$

The inverse of the metric $g_{\mu\nu}$ is

$$g^{-1}_{\mu\nu} = \frac{1}{g}\left[g^*\right]^{\mu\nu} \tag{3.5}$$

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where $[g^*]^{\mu\nu}$ is the adjoint matrix of the metric $g_{\mu\nu}$.
Then Eq.(3.5) can be expressed as follows

$$g^{\mu\nu}\frac{\partial^2\Phi}{\partial x^\mu \partial x^\nu} + \left(\frac{1}{2g}\frac{\partial g}{\partial x^\mu} - \frac{1}{g}\left[g^*\right]^{\lambda\kappa}\frac{\partial g_{\lambda\kappa}}{\partial x^\mu}\right) g^{-1}_{\mu\nu}\frac{\partial \Phi}{\partial x^\nu} - m^2\Phi = 0 \tag{3.6}$$

For the metric (2.9), using the mean value theorem of definite integrals, it can be written as

$$\begin{aligned} g_{\mu\nu} = -\Bigg[&\left(\varsigma_\mu \cdot \int d^4k\, C^\alpha(k)\exp(ikx) - \varsigma_\mu^* \cdot \int d^4k\, \left(C^\alpha(k)\right)^*\exp(-ikx)\right) \\ &\cdot \left(\varsigma_\nu \cdot \int d^4k\, C^\alpha(k)\exp(ikx) - \varsigma_\nu^* \cdot \int d^4k\, \left(C^\alpha(k)\right)^*\exp(-ikx)\right)\Bigg] \end{aligned} \tag{3.7}$$

where k_μ is the function of mean value, ς_μ and ς_μ^* are the mean value of k_μ.
For the form of metric (3.7), we have

$$\frac{1}{2g}\frac{\partial g}{\partial x^\mu} = \frac{1}{g}\left[g^*\right]^{\lambda\kappa}\frac{\partial g_{\lambda\kappa}}{\partial x^\mu} \tag{3.8}$$

For the true metric $\mathrm{g}_{\mu\nu}$, Eq.(3.8) still holds true.
So that Eq.(3.6) can be written as

$$g^{\mu\nu}\frac{\partial^2\Phi}{\partial x^\mu \partial x^\nu} - m^2\Phi = 0 \tag{3.9}$$

Therefore the Klein-Gordon equation in the gravitational field be the usual form as follows

$$\left(\Box^2 - m^2\right)\Phi = 0 \tag{3.10}$$

where $\Box^2$ is the usual D'Alembertian operator in curved spacetime

$$\Box^2 = g^{\mu\nu}\frac{\partial^2}{\partial x^\mu \partial x^\nu} \tag{3.11}$$

Due to the local inertial coordinate, i.e. the graviton, satisfies the wave equation, there is the symmetry of the Klein Gordon equation. It is a symmetry that only holds true in quantum gravity theory.

IV. Conclusion

From the calculation in this paper, it can be seen that although the inverse square law is correct, the true gravitational field does not follow the inverse square law due to the self-interaction. It can be used to explain dark matter.

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EXCEPTIONALITY EXCLUSION. Bridge between Quantization and Relativity above the Stormy Stream of Pseudo-Scientific Speculation

By Stanislav Ordin
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Abstract- The work on correcting the historically layered errors of Quantum Theory," in addition to its specific corrections, provided both an understanding of the reasons for their occurrence and why they were canonized. And, also, it became obvious that the Scientific Misconceptions, both included in the modern "Quantum Theory" and in Einstein's SRT, have a General Character. Therefore, the Unified Theory, as has now become obvious, can and, initially, must be built on the General INVARIANTS of Quantization and the Principle of Relativity, while each of the noted Theories proceeds from the use of an individual non-invariant set of orts, plugging the "holes of theories" with EXCLUSIVITIES. This work is devoted to their identification and elimination, which will help correct both the FOUNDATIONS of the Theory of Relativity and will complement the corrections of the FOUNDATIONS of Quantization.

Keywords: *evidence-based physics, quantization, theory of relativity, subjective EXCLUSIVITY, INVARIANTS.*

GJSFR-A Classification: *LCC: QC174.12*

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I. Reasons for the Occurrence of Exceptionality

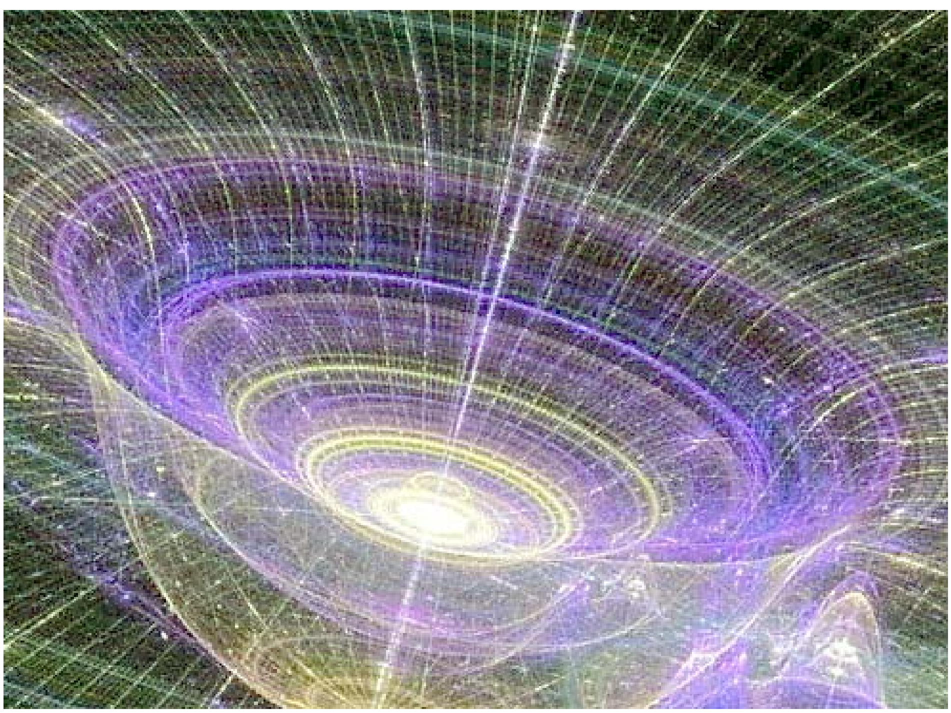

Fig. 1: Original EXCLUSIVITY

The philistine opinion now dominant on Earth that SCIENCE is needed EXCLUSIVELY by scientists, to whom the philistine counts EXCLUSIVELY star-studded ones, is fundamentally erroneous. It is now, unlike the beginning of the 20th century, that is leading humanity to degradation. But the average person also drew this EXCEPTIONALITY from the now degraded SCIENCE. So the purity of the body of SCIENCE, the rigor, the evidence of its Theories, directly influence the CONSCIOUSNESS of everyone.

The final work "NON-SCHRÖDINGER ORBITALS", which was preceded by a whole series of

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works on eliminating mathematical inaccuracies in the BASIS used by modern Quantum Theory, broke through almost a century of bureaucratic parasitism on Schrödinger's imaginaries, which were, without sufficient scientific grounds, dogmatized. But to form a new channel of Science, of course, it will still be necessary to overcome inertia, which will take a lot of time.

And the Children's World, in which this will be overcome, is already the world of my children and already grandchildren. But he lives, as in the days of my youth, with Shakespearean tragedies, written by mature but young people, unlike me, and describing short-term stories. Such "Shakespearean" stories also occur in Science. And they, too, usually lie on the surface and even strive to become like "children's" stories, thereby attractive and "edible" for young minds. And it would seem, why should children be distracted by old people's grumbling about stories with the lifetime of a CENTURY? ""http://rusnor.org/network/social/user/10216/blog/3891/"

I do not undertake to fully answer this question here. But I'll just note that this "grumbling" concerns ETERNITY, which, in principle, is interesting to both young and old, but they imagine it differently. It's just an abstract ETERNITY of Scientific Ideas for young people, as it were, a given, these are memorized "cubes"-emoticons, which are used to compete in the SPEED of folding in the running away TIME, loudly called INTELLIGENCE.

And the elderly see that this ETERNITY may turn out to be FINAL and end up in oblivion. And humanity, at the same time, for CENTURIES can mark time or even fall into the abyss. "http://rusnor.org/network/social/user/10216/blog/3897/""

And there is no way humanity will be able to hold on to "The Catcher in Rye" (now in Lies) without Science. Because it is True Science that is capable, century after century, of "Rising from the ashes like a Phoenix" and, turning off the crooked path, renewed, moving further forward to the Yawning Heights. http://rusnor.org/ network/social/user/10216/blog/3909/

The work "NON-SHRODENGER ORBITALS" completed (at least for a while) my corrections of the BASICS of Quantization, and I returned to the Corrections of the Theory of Relativity, which also has many mathematical inaccuracies in the BASIS.

But, in addition to the age-old misconceptions in the FUNDAMENTALS of the Theory of Relativity, it has been revealed that in its BASIS there are in their primordial form the idea of the Magnetic Field, as "the gimlets of Democritus" passing through the spiral channels of the Earth from the "North Pole" to the "South Pole", which were recorded in modern Science, even in Mathematics, for almost a thousand years-William Gilbert's great book "De Magneto", summing up Mysticism, was published in 1600, but only Oersted's discovery-experiment in 1819 prompted a number of fundamental experimental discoveries in the field of Magnetism. But in the mathematical interpretation, Mysticism was preserved in a form veiled by formulas of Magnetism.

So, we had to start clarifying the BASIS with the work "Redefining Magnetism," which was initially perceived as Mysticism, and has retained its attributes to this day.

II. Consequences of Exceptionality

As Planck showed, behind the EXCLUSIVITIES (Fig. 1) there are simply hidden new, previously unknown INVARIANTS of the General Picture of Nature.

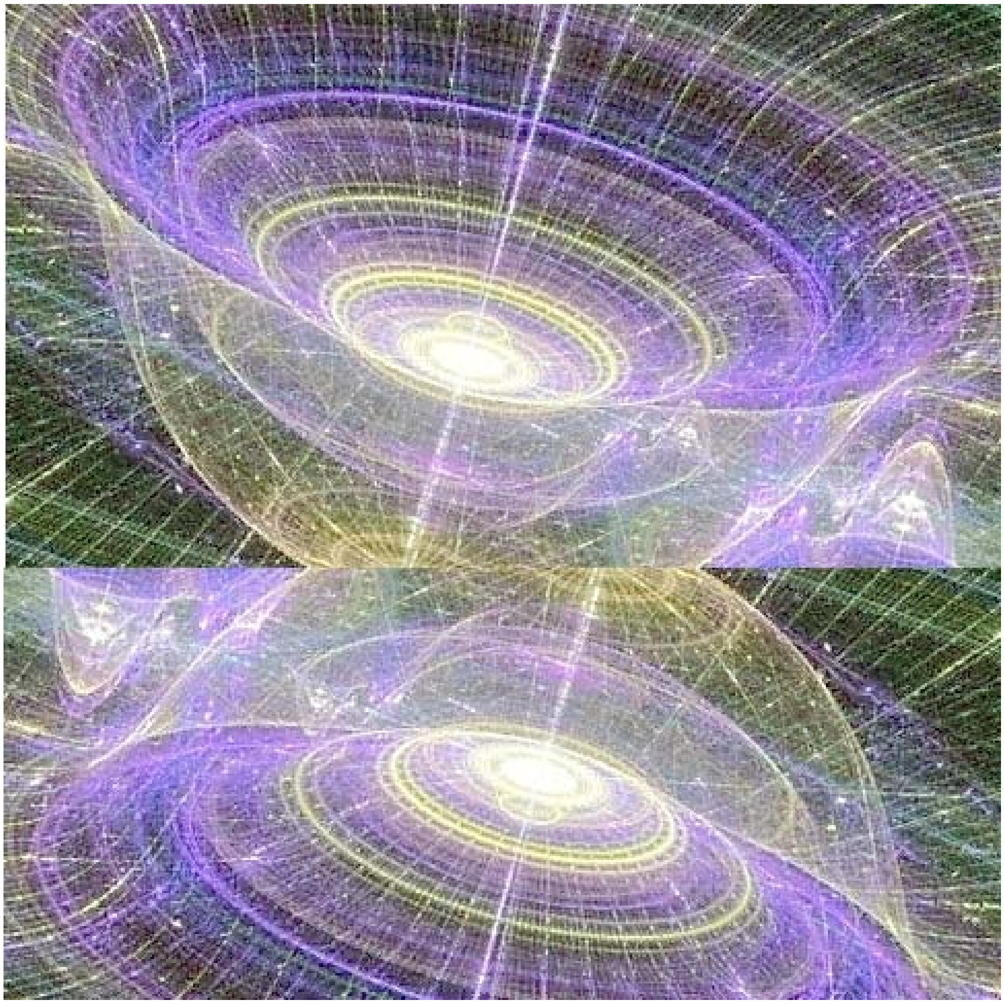

Fig. 2: Two mutually exclusive EXCLUSIVENESS

And the bad infinity of such EXCEPTIONALITY (Fig. 2) gives a lot of local patterns and only destroys the General Picture of the Description of NATURE.

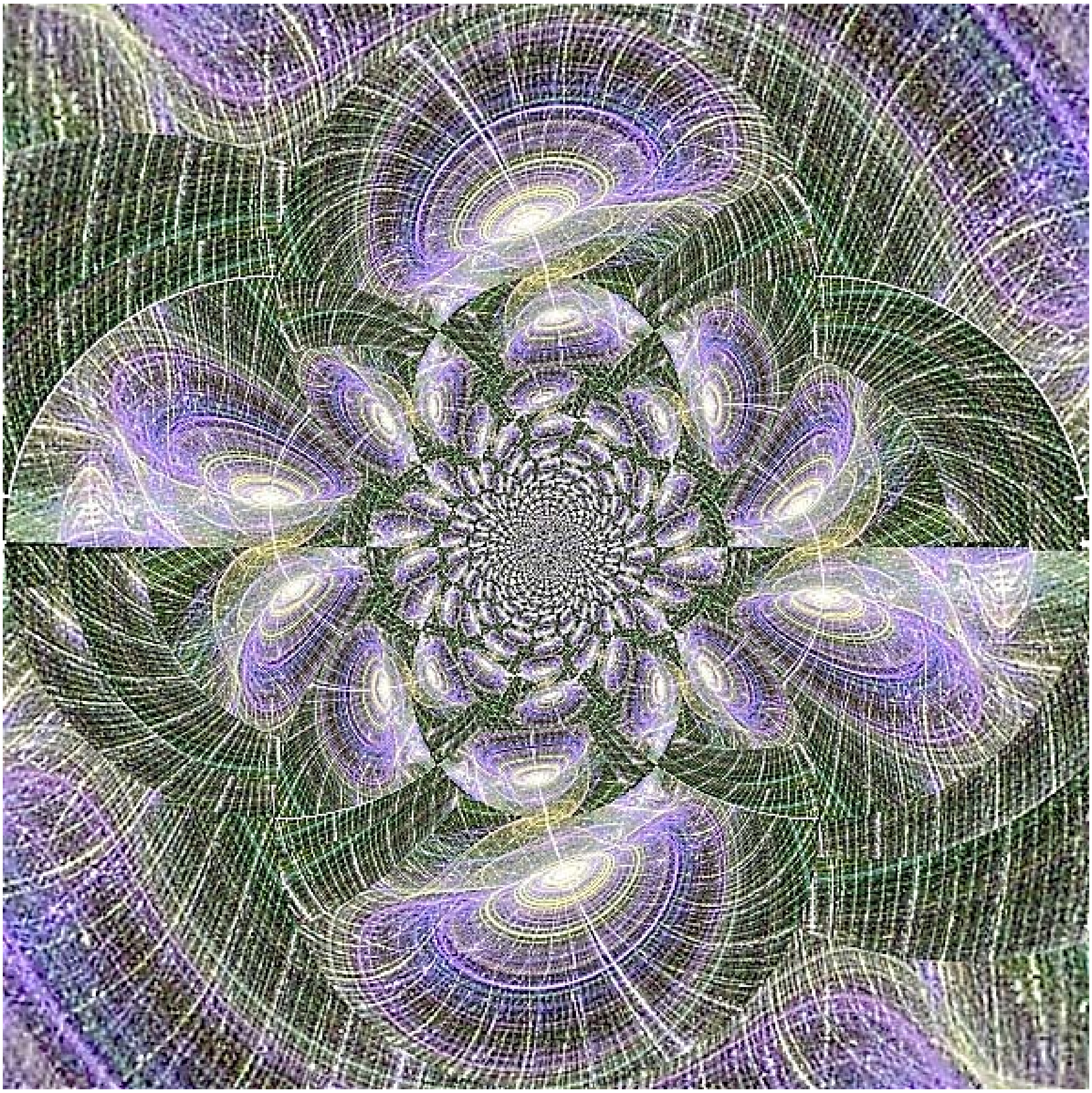

Fig. 3: Transformed Exceptionality, corresponding to a fragment of a theory built on the basis of the original Exceptionality

But EXCEPTIONALITY attracts people, as if bringing them closer to the divine and, thereby, moving them away from True Science, which, in the search for the TRUTH and its evidence, does not hide behind the back of God, like theologians. But Science itself is genetically connected with religion and, thus, has absorbed many EXCLUSIVITIES, which the scientific bureaucracy, whose priorities are not at all scientific, actively exploits to "prove" the significance of Science (or rather, its own significance in "science").

But, thereby, the scientific bureaucracy, in fact, becomes like the pillars of the church, which anathematize new ideas. But the scientific bureaucracy does not reach the level of the church, and by leveling the role of Science in Society, it becomes a sham. And, thus, in the body of Science, these false luminaries of Science accumulate and speculatively promote Scientific Misconceptions [1].

So, the fact that Bohr preferred Planck-Einstein Quantization [2] to Schrödinger's EXCLUSIVITY, and the fact that Einstein's SRT based on Minkowski's EXCEPTIONAL Geometry was preferred to simply the correct Theory of Gravitation by the senior telegraph operator Heaviside, does not require, in principle, any conspiracy theory. It's just that a LACK OF UNDERSTANDING of a number of ELEMENTARY things was speculatively hidden behind EXCEPTIONALITY. At the same time, it was hidden, naturally, not by the luminaries themselves, who clearly limit the limits of applicability of their models, but by scientific clerks who "evaluate" the work of scientists. So the work of the same Einstein on the error of the gravitational waves he

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originally calculated, Phys. Rev. refused to publish because “The locomotive has already started” and titles, honors and money have already been made on these waves.

But the True significance of Science is not in creating the illusion of superficial UNDERSTANDING, but in deep UNDERSTANDING - in the CORRECT, True Description of the World around us. And the EXCLUSIVITY of the SRT itself gave rise to many EXCLUSIVITY that do not require proof, which led away even from attempts at UNDERSTANDING not only in related areas of Physics, but also in the General Picture of the World. Whereas the True Scientific Description shows that even LIFE itself is not EXCLUSIVENESS in our World [3, 4, 5], but is a High Degree of Harmony of Nature [6,7, 8].

Combing fractally developing Science, and, in particular, Physics, is akin to the work of a hairdresser combing a mop of tangled hair - with a quick movement of a small comb you can rip it out and become bald. That is why it is necessary to first use smooth movements of a large comb to select individual areas of very tangled hair, and then carefully comb them with a small comb. Then many EXCEPTIONALITY will simply turn into INDIVIDUALITY. This “large ridge” that reconciled Bohr and Planck was the DUALISM of Functional Sets of the blind Pontryagin, who was blind, but realized that Schrödinger’s Imaginaries are nothing more than shadows of an object that can be identically described by different pairs of parameters related, in the simplest case, by Fourier- transformation.

Narrow-mindedness and narrow-minded professionalism, especially scientific ones, live exclusively by the EXCLUSIVENESS they have for themselves and drawn in CONSCIOUSNESS. And we will immediately exclude God’s chosenness from the consideration of EXCLUSIVITY. Let's talk about really significant things for True Science, Science built on IDEAS, and not on inflated (for the average person) authorities, on Fundamental IDEAS, and not highly specialized ones.

“Shadows”-Imaginaries of Schrödinger, bursting out like a genie from a bottle, formed thick clouds that covered the peaks of Physics. This raised the question of the connection between Physics and Reality, to which Albert Einstein dedicated his book, who never recognized the Copenhagen interpretation of Schrödinger’s “wave function”, while he himself came up with SRT with Schrödinger’s imaginaries, which Schrödinger, by the way, liked.

The main EXCLUSIVENESS of the SRT comes down to the ASSUMPTION that our space-time can be looked at “from above”, i.e. from another, unknown to us, DIMENSION. But being on an infinitely thin plane, while there is no data about the additional dimension, it is impossible to say what is happening above and below it. Or for now at least without knowledge of what counteracts the expansion of the dimension of our OBSERVED Physical Space. So there are no prerequisites for building a garden based on the assumption of some EXCEPTIONALITY solely due to the Power of Thought.

Indeed, even indicating where is top and where is bottom, so that black does not mix with white, and pluses with minuses, is only possible for a plane of non-zero thickness. And for an ant to crawl along a wire, you need to hold on to it. We don’t even know what holds us in our Physical Space. It is unlikely that only the Power of Thought keeps us in our World. And we can move Real mountains with the Power of Thought only in fantasies.

Although, relying only on Logic, the Power of Thought can predict a lot. Even the ancient Greeks, on its basis, reached the understanding of the atomic structure of matter invisible to the eye, which determined the entire Technological Progress and was ultimately confirmed in Technology. With the Power of Thought, again relying on Logic, Copernicus drew the Picture of the Sky not from the point of observation by a person, but from an observation point arbitrarily chosen in space, in particular, mentally from the Sun, which determined the progress of Astronomy.

With the power of thought you can draw Space and an infinite number of dimensions. But in Reality, even in order to simply try to build hypotheses about the “observation” of our four-dimensional space-time from other, EXCLUSIVE positions for space-time, we must first at least logically prove the possibility of the existence of an additional dimension of the Physical World. In the meantime, there is no such evidence, we will exclude providence/ghosts with EXCLUSIVENESS, following Aristotle, from Physics, leaving THEM to Metaphysics and Thoreau’s entertaining cards.

And within the framework of Physics, in principle, the fashionable Theory of EVERYTHING itself is schizophrenic nonsense by definition. After all, you can’t describe what you don’t know. And it is logically possible to get closer to the CORRECT Description of the Picture of the World (like the same Greeks) only from what is already known about it, what has been MEASURED. After all, this is exactly what Ivan Efremov, classified as a science fiction writer, wrote, classified because the artisans did not understand that he was a Scientist with a capital S. He simply looked at the World broadly, and not narrowly in a clannish manner - hence his strictly scientific Discoveries, but completely unexpected for the artisans of science, despite their official scientific titles. The same can be said about Grisha Perelman, who, breaking the already established clannishness even in Mathematics, went right through it in his calculations. And, on this path, the main difficulty of modern, fragmented Science is precisely that it is necessary to correctly put together its various puzzles. And this can be done precisely on the basis of INVARIANTS for all puzzles. And with the Power of

Thought, only in Thoughts can we strive for the Ideal, like an artist towards a picture already "painted" in his head, like Sergei Rachmaninov, who "heard" his symphony in his head ENTIRELY (instantly the whole thing). But is it possible to rise above space-time entirely by the Power of Thought? In principle, probably not. In principle, as if rising above Reality, one can imagine "instant photographs" of only individual "pictures" or "symphonies" of Real space-time. Abstractly, purely mathematically, you can enter any number of dimensions, but to communicate with Reality you need to clearly understand what the additionally introduced orthogonal coordinate is mapped to. How, in the simplest case, this is done to describe one-dimensionally incommensurate quasicrystals in 4-dimensional space, specifying 2 independent ICS along the C axis. Then for quasicrystals we will immediately "see" all possible states of the crystal lattice with two sublattices weakly connected along the C axis [9]. But for them, 4-dimensional symmetry describes all possible static states, and their projections onto a 3-dimensional "plane" describe the arrangement of atoms in Real Space. With the continuously changing polar time, the Power of Thought can only obtain an "instant photograph" - a "freeze frame" of space-time, and to watch the entire "movie" you again need TIME.

But many modern "luminaries of Science" who are building the Theory of EVERYTHING are initially fenced off from Reality and people by their personal EXCLUSIVITY - the ability to spin formulas in their head (or in a computer connected to it) that they actually deify. And one must be able to READ their formulas (and UNDERSTAND them), and their Thoughts between the formulas, in order to UNDERSTAND where they made a mistake and got confused in illusions. That this "EXCEPTIONALITY" of theirs is not based at all on Fundamental Mathematics, unknown to the average person, but, on the contrary, on the fact that they do not know the Fundamental Principles of Mathematics. That THEIR Basic Formulas were simply once chosen by them, chosen on a whim, without evidence, but canonized in the form of "POSITIONS", which were ordered to be taken for granted by "all mortals". But they twist their formulas anyhow - meaninglessly, chaotically. So, pointing your finger at the sky, it is not only impossible to find Physics, but also impossible to control a computer, and even impossible to slide down a hill on a sled without falling off it. And instilling in those around them the special significance of THEIR formulas: "The accessibility of their understanding only to a select few" (but which they themselves do not try to UNDERSTAND), both provides them with life at the pinnacle of Science, and protects them from the psychiatrist. Their EXCEPTIONALITY lies in their schizophrenic psyche, which prevents them from communicating with normal people. And their EXCLUSIVENESS is hypertrophied self-defense. Some of them really need protection, but not at the cost of a break with Reality.

And Reality, naturally, is richer and broader than PRIMITIVE schizophrenic fantasies, despite all their sophistication. But the Description of Reality on the basis of ELEMENTARY things - INVARIANTS, is simpler, more understandable, and does not lead to dissonance in the minds of a wide range of people. So, without any mystical imaginaries, on the basis of the World Constants supplemented by the Planck constant, we have both the radii of the resonant orbits of the electrons of atoms - Electronic Orbitals, and their allowed (resonant" energy levels, which in order of magnitude coincide with the Ionization Potentials for all atoms of the periodic table of Mendeleev (orbitals Schrödinger results in a catastrophic discrepancy between calculations and experiments with increasing Atomic Number) [10].

But there is an area of CREATIVITY, where the description of what is unknown to us (yet) - the FUTURE is possible and consistent. It's just that this is not Physics, this is the area of the Higher Harmony of Nature - human CONSCIOUSNESS. And the special name of such a Description of the FUTURE is known - Dreams. And the pursuit of a Dream is not at all a contradictory activity that leads away from Reality, but on the contrary, it is the engine of progress. But in the sphere of Living Nature, achieving the Dream is consistent because it is a desire to increase the Degree of Harmony of Nature, which, by definition of Living Nature, lowers the Measure of Chaos - Entropy. But in Inanimate Nature, where Entropy does not decrease, normal people do not dream of changing the Fundamental Laws of Nature, but dream of UNDERSTANDING them and learning to use them competently. Whereas schizophrenics dream that Inanimate Nature would be arranged according to their wishes - according to their formulas, with particles of God and Black Holes (in the mind of a schizophrenic there is a lot of room for them, as well as for Dark Matters and Energies, because they, by and large, are blind , poking kittens). And within the framework of a market, schizophrenic society, such schizophrenics have achieved a lot by clouding people's minds and leading modern Science away from Reality. But they are not very interested in Reality, because... in modern schizophrenic society they are in demand by the False Economy [11]. Decorations in the Earth Casino are in demand as exquisite trinkets. And schizophrenics take this "honorable" place of exquisite jewelry for their Real significance. But it is not the decorations on the wall of the Earth casino that determine the thoughts of the players at the table, who imagine themselves as arbiters of destinies, but who, without True Science, are simply ignorant. So, out of all Mathematics, they own and use, by and large, only the Arithmetic of MONEY. Thus, leveling the significance of schizophrenic Science in Society leads to many troubles of modern Humanity.

True Science is an IDEAL to which one can only strive. But striving for this IDEAL is a truly Scientific Search. And to get closer to this IDEAL, it is necessary to find true INVARIANTS, while the schizophrenic EXCEPTIONALITY, primarily “Quantization” and “Theory of Relativity”, hung in the Casino “Earth” in the form of precious decorations, is DIRT and CRAP, clinging to and clouding the IDEAL.

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Bremermann's Limit in *cGh*-Physics

By Gennady Gorelik
Boston University

Abstract- Do physical laws limit the speed of "all data processing systems, manmade as well as biological"? A positive answer, proposed by H. J. Bremermann in 1962, should be corrected to make it compatible with Einstein's theory of gravity (aka general relativity, or GR). As a result, the *Bremermann's limit*, proportional to mass M of the computer, $Mc^2/h = \sim (M/\text{gram})10^{47}$ bits per second, should be replaced by the absolute limit $(c^5/Gh)^{1/2} = \sim 10^{43}$ bits per second, where the universal constants c, G, and h are the speed of light, the gravitational constant, and Planck's constant.

Keywords: *data processing rate, bremermann's limit, general relativity, universal physical constants, planck values, quantum gravity.*

GJSFR-A Classification: *LCC: QC173.96*

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Bremermann's Limit in cGh-Physics

Gennady Gorelik

Abstract- **Do physical laws limit the speed of "all data processing systems, manmade as well as biological"? A positive answer, proposed by H. J. Bremermann in 1962, should be corrected to make it compatible with Einstein's theory of gravity (aka general relativity, or GR). As a result, the *Bremermann's limit*, proportional to mass M of the computer, $Mc^2/h = \sim (M/\text{gram})10^{47}$ bits per second, should be replaced by the absolute limit $(c^5/Gh)^{1/2} = \sim 10^{43}$ bits per second, where the universal constants c, G, and h are the speed of light, the gravitational constant, and Planck's constant.**

Keywords: data processing rate, bremermann's limit, general relativity, universal physical constants, planck values, quantum gravity.

Introduction

Do physical laws limit the speed of computation, or bitrate, of '*all data processing systems, manmade as well as biological*'(hereafter referred to as 'computer')? This question was asked by H. J. Bremermann back in 1962, and his positive answer was the so-called Bremermann's limit $Mc^2/h = \sim (M/\text{gram})\ 10^{47}$ bits per second, where M is the mass of the computer, $c$is the speed of light, and h is Planck's constant.[1]Bremermann derived this limit from two basic physical relations $E = Mc^2$and $\Delta E \Delta \tau > \eta$, but he didn't discuss why his formula contained only these two specific physical constants.

There are many physical constants that are fundamental (i.e., cannot be reduced to other constants by any existing theory) and must be measured experimentally. There are only three fundamental constants that can be called universal, since in any physical phenomenon they can be neglected only if the accuracy of the quantitative description is sufficiently limited. These universal constants are c, h and the gravitational constant G. They participate in the basic equations of the fundamental theories of physics: relativity, quantum mechanics and Einstein's theory of gravity. This cGh-view of the history and interrelation of physical theories was developed in the 1930s by Matvei Bronstein (1906-38).[2]

Bremermann noted that the maximum bitrate of a computer with a mass equal to the mass of the Earth (10^{75} bps) is small compared to the number of all sequences of move in chess or the patterns in a black and white mosaic of 100 × 100 cells. However, while bitrates 10^{47} and 10^{75} are not high enough for some computing tasks, the inverse values, i.e. the duration of one operation– 10^{-47} and 10^{-75} sec, are unreasonably small for theoretical physics, if we keep in mind one have in mind the problem of quantum gravity. The theory of quantum gravity has not yet been created, but some characteristic values of physical parameters are well known, beyond which modern physical theories are inapplicable. These characteristic *Planck values* are constructed from three universal constants c, G, h, and, in particular, the Planck time $\Delta t_{cGh} = (hG/c^5)^{1/2} = 10^{-43}$sec is well above the mentioned durations of one operation(which should be implemented in some physical process).[3]

To deal with this contradiction let's revisit Bremermann's way to his limit. He used the relativistic formula $E = Mc^2$, but ignored the size of computer and therefore implicitly assumed an infinite speed of signal propagation within the computer, which contradicts the theory of relativity.

To obtain the minimum time of one operationΔt in a computer with mass M and linear size L, we should combine quantum constraint $\Delta t > h/\Delta E$, relativistic constraint of available energy $\Delta E < Mc^2$ and require that the speed of signal within computer does not exceed the speed of light $L/\Delta t < c$. Therefore, $\Delta t > \max[h/Mc^2, L/c]$.

This would lead to Bremermann's limit $\Delta t_B = h/Mc^2$, if L could be chosen as small as desired: $L < h/Mc$. However, one cannot be absolutely free in choosing the values of L and M, and here the third universal - gravitational - constant G appears. To prevent the computer from turning into a "black hole" and disappearing beyond the event horizon, the condition $L > GM/c^2$ must be met. So, we get the minimum time for one operation

$\Delta t_{min} = (Gh/c^5)^{1/2} = \sim 10^{-43}$sec, that is Planck time Δt_{cGh}.

Now this is the *absolute* - independent on the computer's mass - *maximum bitrate:*

$(\Delta t_{cGh})^{-1} = (c^5/Gh)^{1/2} = \sim 10^{43}$ bits per second.

The necessity to correct Bremermann's limit (to comply with GR) does not diminish the importance of his question whether the fundamental laws of physics limit processing rate. The significance of such a limitation for cybernetics as systems science (aka computer science)was emphasized by Ross Ash by back in the 1960s.[4]

The quantum limits of GR and the real challenge of quantum gravity were discovered by Matvei Bronstein in his dissertation of 1935 published in two

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articles in 1936.[5] Analyzing quantum constraints on the measurability of gravity, he came to the conclusion that a theory of quantum gravity would require '*the rejection of a Riemannian geometry… and perhaps also the rejection of our ordinary concepts of space and time, replacing them by some much deeper and non-evident concepts*'.[6]

He had too little time to search for those 'non-evident concepts'. In 1937, at the age of 30, he was arrested and six months later executed in a Leningrad prison, as one of the millions of victims of Stalin's terror.

I am grateful to Bentsion Fleishman for introducing me to the issue of Bremermann's limit.

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Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- o Single section and succinct.
- o An outline of the job done is always written in past tense.
- o Concentrate on shortening results—limit background information to a verdict or two.
- o Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

CRITERION FOR GRADING A RESEARCH PAPER (COMPILATION) BY GLOBAL JOURNALS

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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