Unification of the four fundamental forces of nature by a binary quantum model

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Abstract: The binary quantum model introduced here makes it possible to place the four basic fundamental forces on a common basis and to understand why the phenomena "dark energy" and "dark matter" must be indirect effects of gravity. It is also shown how the so-called fine-structure constant α and the Planck constant can be derived from experimental results.
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Résumé: Le modèle quantique binaire présenté ici permet de placer les quatre forces physiques fondamentales sur une base commune, et de comprendre pourquoi les phénomènes de "l'énergie sombre" et de la "matière sombre" doivent être des effets indirects de la gravité. Il est également montré comment la constante αdite de structure fine et la constante de Planck se laissent dériver de résultats expérimentaux.

Key words: Unification of the Four Fundamental Forces; New Theory of Gravitation (NTG); Dark Energy; Dark Matter; Special Theory of Relativity; General Theory of Relativity; Binary Quantum Theory (BQT); Anomalous Secular Increase of the Moon Orbit Eccentricity; Allais Effect; Minimum Energy Principle.

I. INTRODUCTION

During the last century, established physics could celebrate the experimental verification of their most important theories such as the theory of special and general relativity. Also in Quantum Physics, a lot of assertions could be verified. But much more important are the usually unspectacular experimental results, which falsify a theory. One of these unspectacular experimental results is the so-called Allais effect.[1] The Allais effect is a real effect, which can periodically be observed during a solar eclipse, where the Moon changes in tiny parts the direction of the gravitational effect of the Sun on the Earth. According to the Allais effect, gravitation must be an indirect effect, which is caused by something that moves through the Moon and which can with a diminutive probability be deviated by the matter of the Moon. This falsifies the general theory of relativity and does not correspond with the qualities of a so-called Higgs-bosom. Please read Sec. XII and see Fig. 8 to know about the Allais effect. By the "new theory of gravitation" (NTG)[2] of the author, it is possible to explain the Allais effect, the observed increase of the astronomical unit by approximately 7 m per century, as well as the so-called anomalous secular increase of the eccentricity of the lunar orbit.[1,3–5] The scientific problem of modern physics is that it has lost its falsifiability since it started to introduce for any new particle phenomenon an new quantum number and for any emerging contradiction a new theoretical mechanism such as the Higgs-mechanism that shall give mass to elementary particles. But the problem started already with the theory of relativity by Albert Einstein. If one measured another light velocity than c, this would be corrected by the imagination of space or length contraction, so that experiments trying to falsify the imagination of an invariant light velocity, which is the basis of the theory of relativity, must fail. It is the same with the so-called proof of certain mechanisms at CERN, because meanwhile, depending on the moving energy of the colliding particles (protons and antiprotons), there can be produced any particle of a certain mass that is needed to proof the mechanism in question. That there must be something wrong with modern physics shows the fact that quantum physics and the theory for the phenomenon of gravitation, the so-called general theory of relativity, cannot brought together. By the NTG so-called special and general relativistic phenomena are calculated within a Euclidean three-dimensional space. So the NTG induces a new sight on quantum physics and on cosmology leading to the "binary quantum theory" (BQT) introduced in this article.

II. THE NEW CONCEPT OF GRAVITATION OF THE NTG

Today gravitational effects are described by Einstein's general theory of relativity, which uses "time" as a fourth dimension, additional to the usual three-dimensional space. But as I could show in the NTG[2] there is no need to use four dimensions. By very simple considerations and calculations, it is possible to calculate so-called general relativistic effects either. The considerations are simple: If an electromagnetic wave or a mass is moving within a gravitational field, it is confronted with more particles, which generate the phenomenon of gravitation (today usually called gravitons), dependent from their velocity. This must lead to additional gravitational effects, which can be calculated by Einstein's general theory of relativity, as well as by the NTG. Also the so-called special relativistic phenomena could be calculated by the NTG by similar simple considerations. In order to

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understand the considerations well that lead to the BQT it is conducive, if one has read the former article of the author "On the new theory of gravitation" (NTG) published in *Physics Essays*.[2]

According to the NTG of the author, masses must emit some kind of particles, which have no mass and which move through space at the velocity of light. I called these particles "space-particles" (s-particles in short). The space-particles should exist within space "filling up the vacuum" moving randomly through space at the velocity of light. S-particles should be able to get absorbed or should be able to adhere to a mass and after a certain amount of time should be emitted again by the mass. The impulse or energy the mass might get by the absorption or adherence of a space-particle should be lost again by the emission of the s-particle. In the following, I prefer to consider an adherence of s-particles to a mass. By the emission of space-particles, the former randomly distributed space-particles get a spatial orientation, as they now move radially away from the mass. Without a mass or an elemental particle, the s-particles filling up the "vacuum" the s-particles move randomly through space at the velocity of light, so that there cannot result gravitational effects, as in this case the distribution of s-particles was the same anywhere within space. Hereby an elemental particle, or a mass, causes a lack of s-particles in the surrounding of a mass. While the NTG takes place in Euclidean space, Einstein's space is non-Euclidean, or a so-called curved space. In order to understand the gravitational effects in detail, I considered the lack of a s-particle as an abstract particle in itself which I called a "ls-particle" for short. As the emitted space-particles move away from a certain mass at the velocity of light, the gravitational effect should also be spreading at the velocity of light. The emergence of ls-particles in the area of a mass and its surrounding therefore depend on the velocity of light, although the low space-pressure area caused by a mass moves with the mass through space, as if it rested against the mass. The emitted s-particles of a certain mass should lead to repulsion effects on another mass analogously as the light-pressure of the sunlight does on the particles released by comets, but this effect must be smaller than the opposite gravitational effect caused by the ls-particles. As mentioned above, the gravitational effect must be proportional to the number of s-particles which are emitted by a certain mass. This also means that the number of ls-particles a mass is confronted with must be proportional to the number of s-particles a mass is confronted with. The successful calculation of so-called special and general relativistic effects by the NTG[2] encouraged me to examine, if beside the gravitational force the other fundamental physical forces could be derived by a similar mechanism.

III. A BINARY CONCEPT OF QUANTUM PHYSICS

Let us have a basic look on the electromagnetic force. Because of the existence of "positive" and "negative" charges of elemental particles (for example, the positron and the electron), a positron or an electron must cause positive and negative basic material structures in its surrounding. A positron or an electron causes an electromagnetic field energy, respectively, an electromagnetic potential by sending off this "particles." But the charged elemental particles cannot produce these particles themselves, without losing energy or something of their structure, what is not the case. As particles with electromagnetic charges do not seem to change their characteristics by the time, we have to expect that charged elemental particles get a permanent input of either negative or positive space-particles from the vacuum, sending them again off into the vacuum. As I did not want to introduce a new kind of space-particle (which I already introduced in the NTG), the existence of positive and negative charges of elemental particles suggests that there exist two kinds of space-particles, negative and positive space-particles, which I want to call positive basic space-particle and negative basic space-particle in the following, or in short bs-particle$^+$ and bs-particle$^-$, see Fig. 1.

The bs-particles$^+$ and bs-particles$^-$ should exist within space filling up the vacuum, moving randomly through space at the velocity of light. Bs-particles should be able adhere to a positron or an electron and after a certain time should be emitted again into space. The impulse or energy the mass might get by the adherence of a bs-particle is lost again by the emission of the bs-particle. By the emission of one sort of bs-particles, either negative or positive bs-particles, by a positron or electron, the former randomly distributed bs-particles get a spatial orientation, as they now move radially away from the charged elemental particle. By this process, more negative or positive bs-particles are leaving the spatial area of a charged elemental particle than negative of positive bs-particles are randomly moving into the spatial area of this charged elemental particle.

The simplest possible imagination is that also material structures of elemental particles consist of basic particles. As I do not want to introduce further particles, I postulate that there should also exist two kinds of basic particles, namely, positive and negative basic particles, or for short b-particles$^+$ and b- particles$^-$. These positive and negative basic-particles (b-particles$^+$ and b-particles$^-$) should be identical with the positive and negative basic space-particles (bs-particles$^+$ and bs-particles$^-$). While basic-particles (b-particles$^+$ and b-particles$^-$) must be considered to be condensed or bound basic s-particles building up particles, positive and negative basic space-particles (bs-particles$^+$ and bs-particles$^-$) must be considered to be free basic particles moving through space. Only to differ between free and bound basic particles,

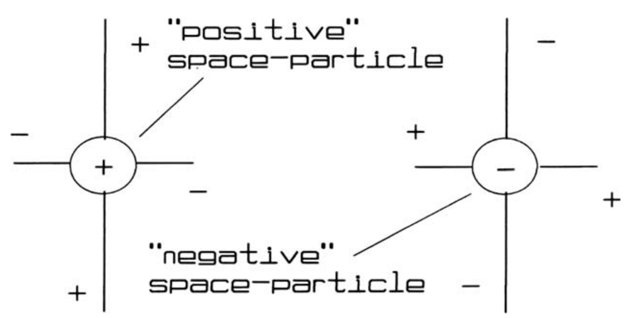

FIG. 1. The postulated two different kinds of basic space-particles (bs-particles), respectively, basic particles (b-particles). The illustrated central circle is only for a better distinction of the two kinds of particles.

the free space particles I named basic space-particles, or bs-particles$^+$ for short, and the bound condensed basic particles I named only basic particles, or b-particles$^+$ and b- particles$^-$ for short. The basic-particles or basic space-particles (b-particles or bs-particles) have to be expected to be very small, so that even neutrinos would be huge particles, so that we should not expect to be ever able to evidence them directly by experimental methods, therefore, of course the following considerations must be to a certain degree speculative consideration. Nevertheless, as I will be able to point out later, based on my imaginations we will be able to calculate the so-called fine-structure constant alpha from the decay times of pions and unify the four basic physical forces.

Because of the production of an electron-positron pair in the Coulomb field of a nucleus or an electron, whereas electromagnetic radiation with a certain minimum energy gets transformed in a negative charged electron and a positive charged positron, we must assume that electromagnetic radiation consists of positive bs-particles (bs-particles$^+$) and negative bs-particles (bs-particles$^-$). The negative charged electron must on the other hand consist of one sort of b-particles and a positive charged positron must consist of another sort of b-particles. Because of the observation that electrons and positrons are attracting each other and electrons are distracting electrons, as well as positrons are distracting positrons, we might conclude that positive basic particles and negative basic particles are attracting each other and positive and positive, as well as negative and negative basic particles are distracting each other. But, if this would be the case, elemental particles would always consist of the same amount of positive and negative basic particles, so that there could not result positive or negative charged particles, such as positrons or electrons, because matter should then always have neutral qualities. We therefore have to postulate that negative basic particles (b-particles$^-$) are attracting b-particles$^-$ and that positive basic particles (b-particles$^+$) are attracting b-particles$^+$, because only then should free b-particles be able to be transformed in condensed b-particles of material structures with different "electric charges," respectively, with different algebraic signs.

To build up larger structures, as for example, positrons or electrons, for a b-particle it must be possible to bind on at least two sides to other b-particles. If a b-particle had more than two binding possibilities, for b-particles with the same algebraic sign, we would expect the existence of larger particles than positrons or electrons consisting only of b-particles$^+$ or b-particles$^-$, what would result in elemental particles with stronger electric charged fields than the so-called elemental electric charge, what is not realized in reality. As the positrons or electrons are very stably, the binding between b-particles$^+$ and b-particles$^+$ and between b-particles$^-$ and b-particles$^-$, building up either a positron or an electron, should be relatively strong, so that we should call this binding between b-particles "strong binding force," see Fig. 2. On the other hand, as there exist much larger elemental particles than electrons or positrons, which are neutral or have the same elemental charge as the small electrons and positrons, for b-particles$^+$ and b-particles$^-$, there should exist a weaker binding possibility between b-particles with different algebraic signs, so that we should call the weak binding between b-particles "weak binding force," see Fig. 3. As we will see later, the strong binding force is correlated with the so-called strong nuclear force. The strong binding force, respectively, the strong nuclear force, can be interpreted as a direct effect between strong binding structures of b-particles with the same algebraic sign. As the strong nuclear force has a range of about 10^{-15} m, the strong binding structures on b-particles or bs-particles should be relatively long structures. The weak binding force is caused by the short binding structures binding to long binding structures with different algebraic signs of different kinds of basic-particles, which is correlated with the so-called weak nuclear force. As the weak nuclear force has a range of about 10^{-18} m, the weak binding structures on b-particles or bs-particles should be relatively short structures. I introduce in this article a structural-mechanistic model based on basic particle structures. I differ between long strong binding structures and short weak binding structures on a basic particle. So we get on the whole two different kinds of basic-particles, positive and negative basic particles (b-particles), which are bound basic particles and identical with free positive and negative basic space-particles (bs-particles). According to that, a positive b-particle or positive bs-particle

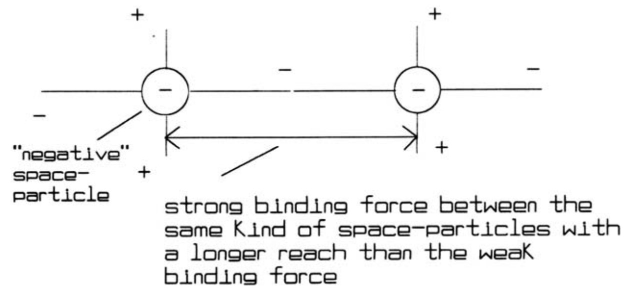

FIG. 2. The long binding structures bind to long binding structures of the same kind of basic-particles causing the strong binding force, which is correlated with the so-called strong nuclear force.

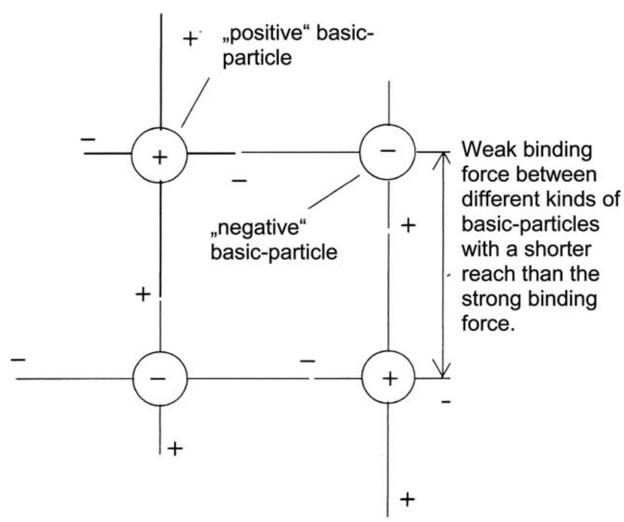

FIG. 3. Short binding structures bind to long binding structures of different kinds of basic-particles causing the weak binding force, which is correlated with the so-called weak nuclear force.

has a positive long binding structure and a negative short binding structure. A negative b-particle or a negative bs-particle has a negative long binding structure and a positive short binding structure. The negative short binding structure of a positive basic particle can bind weak to the negative long binding structure of a negative basic particle. The positive short binding structure of a negative basic particle can bind weak to the positive long binding structure of a positive basic particle. The positive long binding structure of a positive basic particle can bind strong to the positive long binding structure of another positive basic particle. The negative long binding structure of a negative basic particle can bind strong to the negative long binding structure of another a negative basic particle, see Figs. 1–3.

As I want to introduce a structural-mechanistic quantum theory only based on basic particles, I do not want to postulate further particles that mediate the four fundamental forces, as it is postulated by today's physics, for example, the postulated gravitons that mediate the force of gravitation. But how could the basic particles be able to bind to each other in a mechanistic way? The author imagines that on the long and short binding structures there exist some kind of velcro structures at the end of the bindings structures, which are able to connect to each other. Velcro structures on the long and short binding structures would not interfere with each other, as long as they pass each other quickly or do not have sufficient proximity to each other. A fixed connection would then only happen, if the velcro structures were exposed to a certain pressure of basic particles. A fixed connection would also be favored by an advantageous arrangement of the basic space particles within space, as is realized at electromagnetic radiation. This is the reason why electromagnetic radiation can be easily transformed into material structures.

By the weak binding force, there can only result a temporary binding or adherence between condensed basic particles or between condensed basic particles and free basic space-particles (bs-particles), so that there can result the gravitational effect and charge effects by emitting bs-particles, which have been adhered for a certain time to the condensed basic particles the particles shall consist of. The free bs-particles moving through space shall usually not be able to build up material structures spontaneously, but only if there is a reason for condensation, as for example, if particles with adhered bs-particles collide with high velocity. Then the bs-particles, which are adhered to the b-particles of particles, should be able to condense to b-particles and build up new particles. This we can see when so-called energy is transformed into matter. According to my considerations, there only exist attracting forces, an attracting strong binding force also correlated with the so-called strong nuclear force, an attracting weak binding force, correlated with the so-called weak nuclear force and with the attracting electromagnetic force and the attracting gravitational force.

But how can we explain the effect that elemental particles, such as electrons or positrons, with the same algebraic sign of charges are seemingly distracting each other with the same strength elemental particles with different algebraic signs of charges are attracting each other. As the electron causes a so-called negative charged field consisting of bs-particles^{-}, according to the possible binding forces introduced above, we have to postulate that an electron consists of b-particles^{+} binding on each side by the long binding structure to other b-particles^{+}. The b-particles^{+} should hereby be disposed in one line each binding on both sides with another b-particle^{+} probably forming a certain part of a circle. But on the surface of an electron, there remain the short binding negative structures of the b-particles^{+} the electron consists of, which can weakly bind to the long binding negative structures of free bs-particles^{-}, but only for a certain time, so that the free bs-particles^{-} leave the electron again moving away from the electron with the velocity of light in all directions. This spreading of bs-particles^{-} from an electron can be equated with the negative elemental charge surrounding of an electron and spreading into space from the electron with the velocity of light in all directions from the electron, corresponding with the physical term "Coulomb field." Similar to the effect introduced at the explanation of the gravitational effect, more free negative bs-particles than positive bs-particles are leaving the electron radially, so that there results a gradient with more free negative bs-particles around the electron and therefore also relative less free positive bs-particles in the direction of the electron. But on the opposite side, there results a gradient with relative less free negative bs-particles and therefore also relative more free positive bs-particles. If two electrons are brought together, they should be pushed away from each other by the more frequent free negative bs-particles moving away from each electron, as each electron is pulled away by the stream of the emitted negative bs-particles of each electron. The positron consisting of negative b-particles with free positive short binding structures on its surface will in this case be pushed toward the position of an electron by the relative more frequent free positive bs-particles moving toward the electron.

As the positron causes a so-called positive charged field consisting of bs-particles^{+}, according to the possible binding forces introduced above, we have to postulate that a positron consists of b- particles^{-} binding on each side by the long binding structure to other b-particles^{-}. The b-particles^{-} should hereby disposed in one line each binding on both sides with another b- particle^{-} and probably forming a certain part of a circle. But on the surface of the positron, there remain the short binding positive structures of the b-particles^{-} the positron consists of, which can weakly bind to the long binding negative structures of free bs-particles^{+}, but only for a certain time, so that the free bs-particles^{+} leave the positron again moving away from the positron with the velocity of light in all directions. Similar to the effect introduced at the explanation of the gravitational effect, more free positive bs-particles than negative bs-particles are leaving the positron radially, so that there results a gradient with more free positive bs-particles around the positron and therefore also relative less free negative bs-particles in the direction of the positron. But on the opposite side, there results a gradient with relative less free positive bs-particles and relative more free negative bs-particles.

If two positrons are brought together, they should be pushed away from each other by the more frequent free positive bs-particles moving away from each positron, as each positron is pulled away by the stream of the emitted positive bs-particles of each positron. The electron consisting of positive b-particles with free negative short binding structures on its surface will in this case be pushed toward the position of a positron by the relative more frequent free negative bs-particles moving toward the electron. This explains why charged particles with opposite algebraic signs, for example, an electron and a positron, are seemingly attracting each other and why two electrons or two positrons, respectively, two charged particles with the same algebraic signs, are seemingly disattracting each other. Beside the gravitational effect by the emission of basic space-particles (bs-particles) explained by the NTG, in this case, we additionally get a charge effect within space. If we consider a so-called neutral charged elemental particle, only the gravitational effect occurs within space, but not the charge effect, although the mass causes a spatial orientation of the former randomly distributed bs-particles, in this case, the negative or positive bs-particles are nevertheless distributed to equal parts within space. The question arises why an electron and a positron consist obviously of the same amount of b- particles$^+$, respectively, b-particles$^-$? And why do they just consist of this certain amount of b-particles? We can answer this as following: The electron consisting of b-particles$^+$ causes an electromagnetic field consisting of free bs-particles$^-$. This field of free bs-particles$^-$, which increases with the amount of b-particles$^+$ a electron consists of, will after a certain density of the negative field be able to prevent further free bs-particles$^+$ from binding to the long positive binding structures of the b-particles$^+$ of an electron, because positive free particles get rare in the surrounding of the electron, so that there results a balance of bound structures. The positron consisting of b- particles$^-$ causes an electromagnetic field consisting of free bs-particles$^+$. This field of free bs-particles$^+$, which increases with the amount of b- particles$^-$ a positron consists of, will after a certain density of the field be able to prevent further free bs- particles$^-$ from binding to the long negative binding structures of the b- particles$^-$ of a positron, because negative free particles get rare in the surrounding of the positron, so that there results a balance of bound structures.

Let us now examine at this state if the considerations may correspond with reality. If the electromagnetic field of an electron consisting of free bs-particles$^-$ is able to prevent further free bs-particles$^+$ from binding to the positive long binding structures of the b-particles$^+$ on both ends of an electron, this means that the three-dimensional negative electromagnetic field of the electron must have the same strength, as the strong binding between the positive long binding structures of two b-particles$^+$. If the electromagnetic field of a positron consisting of free bs-particles$^+$ is able to prevent further free bs- particles$^-$ from binding to the negative long binding structures of b- particles$^-$ on both ends of the positron, this means that the three-dimensional positive electromagnetic field of the positron has the same strength, as the strong binding between the negative long binding structures between two particles$^-$. With other words, the strength between two long binding structures with the same algebraic sign (strong binding force) must be correlated with the strength of the so-called electromagnetic force. As it is plausible that the strong binding force causes the strong nuclear force, we have to examine the smallest particle, which is able to interact by the strong nuclear force, which is the so-called pion. Going from the assumption that a pion is not built up by smaller elemental particles like "quarks," as it is suggested by today's quantum physics, we should be able to use the plausible correlation between the mass and the amount of b-particles a particle like the pion consists of.

According to the theory introduced in this article, basic particles build up particles like electrons or pions. So it is plausible to imagine that the mass and the amount of b-particles particles consist of are correlated. With other words, the more b-particles build up a particle, the larger the mass of the particle should be. The basic particles a particle consists of shall also be responsible for all four basic physical forces, whereas the so-called strong and weak nuclear forces result from a direct contact between bound basic particles and the electromagnetic and the gravitational forces are indirect forces caused by the interaction between bound basic particles (b-particles) and free basic particles of space (bs-particles = basic space particles).

All interactions in the universe are governed by the four fundamental forces of physics: Electromagnetic, weak, strong, and gravitational forces. These forces are very different in strength and range. Nobody can say, for example, how strong the gravitational force is at a distance of 10^{-15} m or of 10^{-18} m, what makes it impossible to compare the strengths of the four fundamental forces directly and by their absolute values at a certain range. In attributing a relative strength to the four fundamental forces, it has been proved useful to quote the strength in terms of a coupling constant. According to my considerations above, it is plausible that the relative strengths, respectively, the coupling constants of the four basic physical forces, must be also correlated with the amount of b-particles a particle consists of. If we compare only the relative strengths of the four fundamental forces represented by their coupling constants, the absolute strength of the forces at a certain radius does not matter.

The smallest and least complex particle, which is able to interact with the strong and with the electromagnetic force, is a charged pion. According to my considerations, a charged pion has a charged structure, which is represented by b-particles bound to each other by the long strong binding structure, whereas the short weak binding structures stick out of the surface of this charged part of the pion. This short weak binding structures sticking out of the surface of the charged part of a pion interact with the long binding structures of free bs-particles and cause the electromagnetic field, respectively, electromagnetic force. The neutral part of the pion consists of a certain amount of b-particles, which are alternately bound to each other with the long strong binding structure to the short weak binding structure of another b-particle with the opposite algebraic sign, so that on the surface of the neutral part of the charged pion there alternately stick out long strong binding structures and short weak short binding structures with the same algebraic sign.

Consider that the algebraic signs stand here for the two different kinds of b-particles and not for the positive and negative structures on the two kinds of b-particles (see Figs. 4 and 5). The long binding structures sticking out of the surface of the neutral part of a charged pion shall be responsible for the strong nuclear force, by which the charged pion can interact. The short binding structures of the charged part of a pion, shown in the central part of Figs. 4 and 5, will in this case emit an electric field, which should prevent further long binding structures of free bs-particles from binding strong to the long binding structures on the surface of the pion. But the long binding structures sticking out of the surface of the pion still can bind direct to long binding structures of other pions or certain other particles, what causes the strong nuclear force. As we go from the imagination that the rest mass of a particle depends on the amount of b-particles bound within the particle, and as the b-particles shall cause the fundamental forces, we should be able to compare the relative strength of the strong nuclear force with the relative strength electromagnetic force dividing the coupling constant α_s of the strong nuclear force minus the coupling constant α of the electromagnetic force by the mass of the negative or positive charged pion (139.57 MeV) minus the mass of the electron (0.511 MeV) and dividing the coupling constant α of the electromagnetic force by the mass of an electron (0.511 MeV).

If we chose more complex particles than pions, the comparison between the rest masses and the coupling constants would fail. (The coupling constants represent the relative strengths of the different forces. The rest masses represent the number of b-particles the particles consist of.) As we want to calculate the relative strength of a force independent from the number of b-particles the particles consist of, we have to divide the coupling constants by the different rest masses

$$\frac{\text{Coupling Constant } \alpha}{0.511 \text{ MeV}} = \frac{\text{Coupling Constant } \alpha_s - \text{Coupling Constant } \alpha}{139.57 \text{ MeV} - 0.511 \text{ MeV}}. \quad (1)$$

As we must also consider that only the half of the b-particles of the neural part of the charged pion stick out with the long strong binding structures of the surface of the neutral part of the charged pion, only half of the bound b-particles are available for causing the strong nuclear force. Therefore, we have to divide the value of the mass of the neutral part of the pion on the right side of the equation by two, so that we get for the proportionality between the coupling constant $\boldsymbol{\alpha_s}$ of the strong nuclear force and the coupling constant $\boldsymbol{\alpha}$ of the electromagnetic force

$$\frac{\text{Coupling Constant } \alpha}{0.511 \text{ MeV}} = \frac{\text{Coupling Constant } \alpha_s - \text{Coupling Constant } \alpha}{\frac{139.57 \text{ MeV}}{2} - 0.511 \text{ MeV}},$$

$$\frac{\text{Coupling Constant } \alpha}{0.511 \text{ MeV}} = \frac{\text{Coupling Constant } \alpha_s - 0.00729735}{69.274 \text{ MeV}}, \quad (2)$$

$$\alpha = \frac{\text{Coupling Constant } \alpha_s - 0.00729735}{69.274 \text{ MeV}} \times 0.511 \text{ MeV}.$$

If we put in the relative value 1 for the coupling constant $\boldsymbol{\alpha_s}$ of the strong nuclear force, we get for the coupling constant $\boldsymbol{\alpha}$ as a value for the relative strength of the electromagnetic force

$$\alpha = \frac{0.9927}{69.274 \text{ MeV}} \times 0.511 \text{ MeV}$$

$$\alpha = 0.0143 \times 0.511 = 0.0073. \quad (3)$$

This calculated value corresponds with the relative strength for the electromagnetic force in comparison with the strong nuclear force, as it is given by today's physics

$$\alpha = \frac{1}{137.036} = 0.00729735 \approx 0.0073. \quad (4)$$

This result should not be a coincidental result.

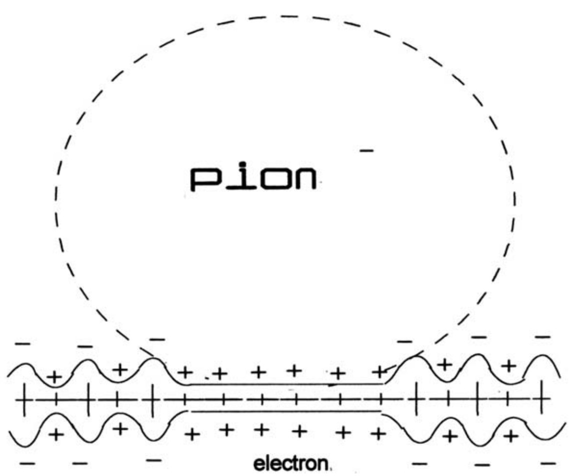

FIG. 4. A simplified model of a negative pion. Consider that the algebraic signs stand here for the two different kinds of b-particles. If we used the algebraic signs for the positive and negative structures on the two kinds of b-particles, the algebraic signs for the short binding structures would have the opposite algebraic sign.

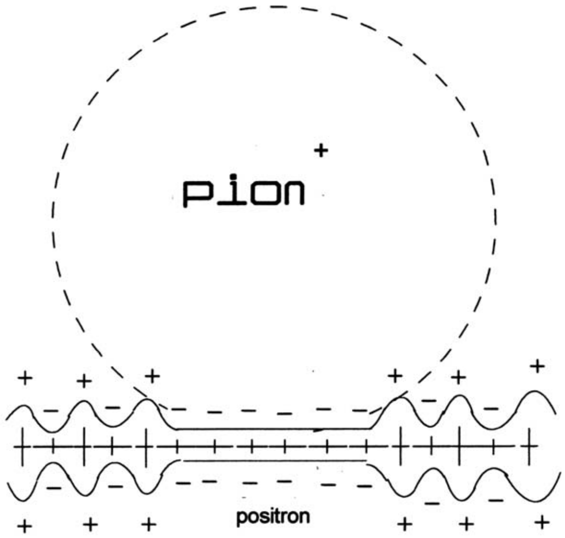

FIG. 5. A simplified model of a positive pion. Consider that the algebraic signs stand here for the two different kinds of b-particles. If we used the algebraic signs for the positive and negative structures on the two kinds of b-particles, the algebraic signs for the short binding structures would have the opposite algebraic sign.

IV. UNIFICATION OF THE ELECTROMAGNETIC FORCE AND THE WEAK NUCLEAR FORCE AND DERIVATION OF THE FINE-STRUCTURE CONSTANT α FROM THE DECAY TIMES OF PIONS

The relative value of the strength of the electromagnetic force corresponds with the so-called fine-structure constant α. According to my imaginations, the electromagnetic force is nothing else than the weak binding force transferred into space by the emission of free bs-particles in all directions. The weak binding force is itself only a direct one-dimensional force between bound basic particles of different algebraic signs. But the electromagnetic force is a three-dimensional indirect force between bound basic particles (b-particles) and free basic particles (bs-particles), caused by the emission of either positive or negative bs-particles in all directions. For better understanding what the term "three-dimensional" force means, you can imagine an electromagnetic field or a gravitational field spreading within the three-dimensional space. The relative strength of the electromagnetic force is given by about 1/137.036 ($0.00729735 \approx 0.0073$). As the direct one-dimensional weak binding force must get stronger, if it gets transformed into the indirect three-dimensional electromagnetic force, we can calculate the coupling constant $\boldsymbol{\alpha}_{\mathbf{W}}$ of the weak binding force from the coupling constant $\boldsymbol{\alpha}$ of the electromagnetic force in comparison with coupling constant $\boldsymbol{\alpha}_{\mathbf{S}}$ of the strong force. For the coupling constant $\boldsymbol{\alpha}_{\mathbf{W}}$ of the relative strength of the weak binding force, we therefore get

$$\frac{(\alpha_W)^3}{\alpha_S} = \frac{\alpha}{\alpha_S}, \quad \frac{(\alpha_W)^3}{\alpha_S} = \frac{\sqrt[3]{\alpha}}{\alpha_S}. \tag{5}$$

As the coupling constant α of the electromagnetic force is many times stronger than the coupling constant of the weak binding force, this term is only correct, if we inserted for the coupling constant α of the electromagnetic force a value which is a multiple larger than the value of the coupling constant α_W for the weak binding force. (If the coupling constant α_W of the weak binding force is one, the coupling constant α of the electromagnetic force should be about 18 000.) But as we use relative values of the coupling constants compared with the coupling constant α_S of the strong nuclear force with the relative value 1, the following term must be correct:

$$\begin{aligned} \frac{\alpha_W}{\alpha_S} &= \frac{(\alpha)^3}{\alpha_S}, \\ \frac{\alpha_W}{1} &= \frac{(\alpha)^3}{1}, \\ \alpha_W &= (\alpha)^3 \\ \alpha_W &= \frac{\left(\frac{1}{137.036}\right)^3}{1}, \\ \alpha_W &= \frac{3.886 \times 10^{-7}}{1} \approx 3.9 \times 10^{-7}. \end{aligned} \tag{6}$$

This relative value for the strength of the weak binding force is here defined by the binding between b-particles of different algebraic signs, respectively, the binding strength between a long binding structure and a short binding structure with the same algebraic. As the weak binding force should also be responsible for the so-called weak nuclear force, the strength of the weak binding force should have the same strength as the weak nuclear force, but as the weak nuclear force keeps different instable particles together, it might differ somewhat from the value for the weak binding force we derived above.

By the comparison of decay times of particles, we can calculate the relative strengths of the forces, which stabilize the particles, if the compared particles have as far as possible a simple inner structure, so that the strong force is not involved in the stabilization of the particle compared with each other, and if the inner structure of the compared particles is as far as possible the same. Only the pions satisfy these conditions. The neutral pion is only stabilized by the weak nuclear force, while the positive or negative pion must be stabilized by the weak nuclear force and by the electromagnetic force. By considering the decay time of a negative or positive pion (2.6×10^{-8} s) in comparison with the decay time of a neutral pion, according to my imaginations, we can calculate the relative strength of the electromagnetic force in comparison with the weak nuclear force. The decay time of the neutral pion of 8.3×10^{-17} s (7.82 eV) is the latest measured value which is a factor of 2.1 more precise than the currently accepted value of 8.4×10^{-17} s. As the positive or negative pion is stabilized by the electromagnetic force and the weak nuclear force, the decay time of the charged pion we have to refer to the electromagnetic force and the weak nuclear force. Therefore, we get for the relative strength of the electromagnetic force in comparison with the relative strength of the weak nuclear force, if we use again the coupling constants for our calculations

$$\begin{aligned}\frac{\alpha+\alpha_W}{\alpha_W} &= \sqrt{\frac{2.6^{-8}s}{8.3^{-17}s}},\\ \frac{\alpha}{\alpha_W}+1 &= \sqrt{\frac{2.6^{-8}s}{8.3^{-17}s}} = 17698.955,\\ \frac{\alpha}{\alpha_W} &= \sqrt{\frac{2.6^{-8}s}{8.3^{-17}s}}-1 = 17697.955.\end{aligned} \tag{7}$$

While I postulated a relative value for the weak binding force of about 3.886×10^{-7}, by the comparison of the decay times of charged and neutral pions according to the last equation we get

$$\begin{aligned}\frac{\alpha_W}{\alpha} &= \frac{1}{17697.955},\\ \alpha_W &= 5.65\times10^{-5}\times\alpha,\\ \alpha_W &= 5.65\times10^{-5}\times0.00729735 = 4.1\times10^{-7}.\end{aligned} \tag{8}$$

But if we want to derive the fine-structure constant α from the decay times of pions, we must compare the relative strength of the electromagnetic force with the weak nuclear force, independent from the different amount of b-particles a charged or a neutral pion consists of. According to this, we have to refer the relative strengths of the forces to the masses of the charged and neutral pion, as the mass should be related to the amount of b-particles the pion consists of. Therefore, we have to refer the electromagnetic force to the rest mass of the charged pion, which is given by 139.57 MeV. The weak nuclear force with the coupling constant α_W we have to refer to the mass of the neutral pion, which is given by 134.98 MeV. Considering that the weak nuclear force of the pion is not caused by the short weak binding structures of b-particles, which stick out of the surface of the pions, but by the binding between the short weak binding structure and the long strong binding structures of all b-particles representing the neutral part of the charged and neutral pion, we must refer to all b-particles bound within the neutral part of pions

A neutral pion usually decays into two photons, but the second largest π^0 decay mode is into a photon and an electron-positron pair. Therefore, a neutral pion should be considered to be a particle, which is build up by either a positive pion or a negative pion, which has an additional charged part of either an electron or a positron. If we considered a neutral pion to be a charged pion, which has just got an additional positron, respectively, electron, the rest mass of the neutral pion should be larger than that of a charged pion. So it is plausible to go from the imagination that from the neutral part of a charged pion a certain number of the b-particles were changed into a positron, respectively, electron, whereas some of the b-particles of the neutral part got lost. As we only want to compare the rest masses of the neutral parts of the charged and neutral pions, we have to subtract from the charged pion the rest mass of one electron or positron and from the neutral pion the rest mass of a positron and an electron, so that we get on the whole

$$\begin{aligned}\frac{\alpha_W}{\alpha} &= \frac{134.98\text{ MeV}-1.022\text{ MeV}\times\alpha_W}{139.57\text{ MeV}-0.511\text{ MeV}\times\alpha},\\ \alpha_W &= \frac{133.96\text{ MeV}\times\alpha_W}{139.06\text{ MeV}},\\ \alpha_W &= 0.96\times\alpha_W,\\ \alpha_W &= 0.96\times4.1\times10^{-7} = 3.9\times10^{-7}.\end{aligned} \tag{9}$$

Of course, there does not exist a direct proof that a neutral pion contains a negative and a positive charged structure comparable to an electron and a positron, but it seems to me much more plausible than the imagination of the today's quark model, according to which a neutral pion contains a combination of up, down, antiup and antidown quark and therefore a combination of negative charges of −2/3 and −1/3 and positive charges of +2/3 and +1/3.

The calculated value corresponds very well with the relative value I calculated above for the weak binding force (3.886×10^{-7}), which I derived by the imagination that the electromagnetic force is nothing else than the weak binding force transferred into space by emitting free bs-particles in all directions and therefore in all three dimensions of space. From the value we found for the weak nuclear force by examining the decay times of the charged and neutral pion according to my considerations, we can derive the relative strength of the electromagnetic force, which corresponds with the value for the fine-structure constant α

$$\begin{aligned}\alpha &= \sqrt[3]{\alpha_W},\\ \alpha &= \sqrt[3]{0.96\times\alpha_W},\\ \alpha &= \sqrt[3]{0.96\times4.1\times10^{-7}} = \sqrt[3]{3.9\times10^{-7}},\\ \alpha &= 0.0073.\end{aligned} \tag{10}$$

This result should not be a coincidental result. The calculated value for the relative strength of the electromagnetic force corresponds very well with the measured strength of today's physics for the electromagnetic force, which is given by

$$\alpha = \frac{1}{137.0359895} = 0.00729735. \tag{11}$$

The relative value for the relative strength of the weak nuclear force, respectively, the so-called coupling constant, as an indicator of interaction strength, is given between a wide range between 10^{-5} and 10^{-15}, compared with the strong interaction's coupling constant of about 1, as the weak nuclear force depends on the energy of the observed system. The most often cited interaction coupling constant of the weak nuclear strength lies between a value of 10^{-7} and 10^{-6}, compared with the strong interaction's coupling constant of about 1, which corresponds with my considerations and calculations. This encouraged me to go on with my considerations.

V. IMPROVED CONCEPT OF THE NTG

To understand the considerations in this section well, it is advantageous to have read the former article of the author "On the new theory of gravitation" (NTG) published in *Physics Essays*.[2] It is possible to calculate so-called special and general relativistic phenomena, if one postulates that gravitation is initiated by some kind of structure or particle, which leaves a mass at the velocity of light in all directions and changes the quality of space, so that the changed spatial qualities can cause the gravitational effect on masses. Therefore, in the NTG,[2] I suggested that masses emit real particles, which have no mass and which move through space at the velocity of light. I called these particles in my former article space-particles (s-particles in short). In the BQT, I discriminated between free space particles, which I called "basic-space-particles" (bs-particles) and bound space-particle, which I called "basic-particles" (b-particles). The basic-space-particles (bs-particles) should exist within space filling up the vacuum, moving randomly through space at the velocity of light. I postulated that bs-particles can be absorbed or can adhere to a mass consisting of b-particles and after a certain (short) time can be emitted again by the mass. The impulse or energy the mass might get by the absorption or adherence of a space-particle is lost again by the emission of the bs-particle. In the following, I preferred to consider an adherence of basic space particles (bs-particles) to a mass. By the emission of bs-particles the former randomly distributed bs-particles get a spatial orientation, as they now move radially away from the mass. I thought that by this process, more bs-particles should be leaving the spatial area of a mass than randomly are moving into the spatial area of this mass, so I postulated a lack of bs-particles within the vacuum in the surrounding of a mass, which should cause the gravitational effect. Without a mass, respectively, a (elemental) particle, the bs-particles filling up the vacuum move randomly through space by the velocity of light, so that there could not result gravitational effects, as in this case the density of bs-particles is the same anywhere within space. Therefore, I expected a mass to cause a low-pressure area or low-density spatial area of bs-particles within the vacuum. The low-pressure spatial area should hereby try to be filled up with bs-particles, which means that the bs-particles adhered to a certain mass are sucked toward the low-pressure spatial area caused by another mass, so that the mass on the whole should be carried toward the low-pressure area of another mass. However, I finally had to accept that the amount of bs-particles leaving the spatial area of a mass radially cannot be larger than the amount of bs-particles moving randomly into the spatial area of this mass. So it cannot be the change of the amount of bs-particles, which causes gravitation, but only the change of the spatial orientation of the movement of the bs-particles themselves.

To understand this, we have to examine the two kinds of bs-particles introduced by the BQT, see Fig. 2. Each kind of bs-particle should be able to move either in the direction of the long binding structure or in the direction of the short binding structure. If we examine an electron, there should stick out of the surface of the electron short binding negative structures, to which long binding structures of negative bs-particles can adhere for a certain time (see Fig. 4). After a certain time, the negative bs-particles are leaving the surface of the electron in the direction of the negative long binding structure causing the electromagnetic field. But there still remains the possibility that bs-particles move in the direction of their short binding structure. Once got its orientation the movement of a bs-particle, either in the direction of the long binding structure, or the short binding structure, must be stable, elsewhere an electromagnetic field or an electromagnetic radiation could not be stable either.

Let us examine particles (masses) like pions (see Figs. 4 and 5) or a proton: On the surface of the neutral part of the particles (masses), there stick out long **and** short binding structures with the same algebraic sign of the alternately bound basic particles (b-particles) of different algebraic signs. It is possible that there happens an adherence of free negative **and** positive basic particles (bs-particles) from space with their long binding structures of different algebraic signs to the long binding structures, respectively, the short binding structures sticking out of the bound b-particles of the pion. And it is also possible that there happens an adherence of free negative **or** free positive basic particles with their short binding to the long binding structures sticking out of the surface of the mass. On the whole, therefore, the emission of bs-particles moving away from the mass in the direction of their long binding structure must happen more frequently than the emission of bs-particles moving away from the mass in the direction of their short binding structure, what must cause a gradient, which should be responsible for the gravitational force.

If the short and long binding structures of bs-particles (with a different algebraic sign) and long binding structures of bs-particles (with the same algebraic sign) can adhere to bound b-particles of particles, this is only possible by a certain direct attraction between the involved structures. In most cases, the bs-particles of space will not adhere to b-particles, but only touch the b-particles of a particle (a mass), causing a certain pull or pressure in the direction of the movement. As free bs-particles, which move in the direction of their short binding structure (with the long binding structure standing out on both sides), will meet a certain mass more probably than free bs-particles, which move in the direction of their long binding structure (with the short binding structure standing out on both sides), the pull or pressure on the bound b-particles of a mass must be weaker, if a mass emits less bs-particles moving in the direction of the short binding structure. Therefore, the pull or pressure from the side of the mass must be weaker than from the other side. On the side of the mass, the space particle pressure P(1) results now from a combination of randomly moving bs-particles and less radially moving bs-particles with short binding structures in front, while on the opposite side, the space particle pressure P(2) still results only from the randomly moving bs-particles. This means that the pressure on the opposite side of a mass must be higher than on the side of the mass (Fig. 6). This difference causes a gradient of space-particle pressure between the side of the mass and the opposite side. This gradient of space pressure gets smaller by

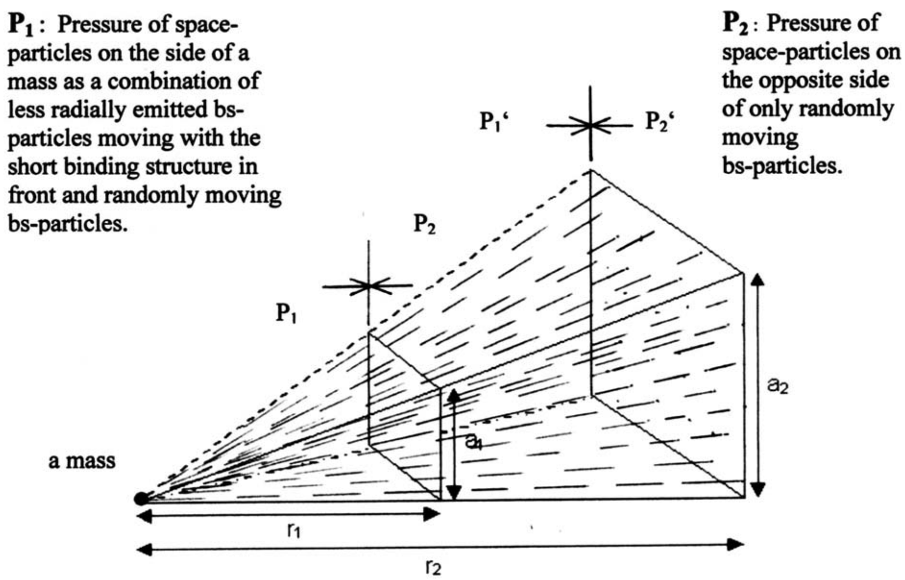

FIG. 6. There results a gradient of space-particle pressure causing gravitation, as on the side of the mass the space-particle pressure is lower.

the factor $1/r^2$, when the distance from the mass increases. According to this, gravitation seems nothing else than the result of a gradient of space-particle pressure caused by masses within space by emitting less bs-particles moving radially in the direction of their short binding structure than bs-particles moving radially in the direction of their long binding structure. So we get for the different space-particle pressures

$$P_2 \rangle P_1,$$
$$P_1 = P_2 - \frac{\Delta P}{r^2}. \tag{12}$$

For the gravitational force, we get by inserting P_1

$$Gravitation = f_g = P_2 - P_1,$$
$$f_g = P_2 - \left(P_2 - \frac{\Delta P}{r^2}\right), \tag{13}$$
$$f_G = \frac{\Delta P}{r^2}.$$

If another mass is now resting in a certain distance from the first mass, this mass gets by the somewhat higher pressure from the opposite side pressed toward the first mass, whereas the second mass has of course the same effect on the first mass. While the NTG takes place in Euclidean space, Einstein's space is non-Euclidean, or a so-called curved space. In order to understand the gravitational effects in detail, in my former article "On the new theory of Gravitation (NTG)," I considered the lack of a bs-particle as an (abstract) particle in itself, which I called a ls-particle for short. This is a helpful simplification in order to understand and calculate the additional gravitational effects more easily, which are usually thought to be so-called relativistic effects. But now we know that a mass does not cause a lack of bs-particles on the whole, but only a lack of bs-particles, which move away from the mass radially in the direction of their short binding structure. As the emitted bs-particles move away from a certain mass at the velocity of light, the gravitational effect should also be spreading at the velocity of light. The emergence of ls-particles in the area of a mass and its surrounding therefore depend on the velocity of light, although this low bs-particle pressure area (or high bs-particle pressure area on the opposite side) caused by a mass moves with the mass through space, as if it rested against the mass. The imagination I introduced in my former article that by a mass there results a lack of space particles within the vacuum around a certain mass can be still used, but the imagination that by this lack of bs-particles the masses are sucked toward each other by low-pressure areas around masses is not correct. In reality, the masses are obviously pressed toward each other by a higher pressure from the opposite sides. For the calculated results, the difference between these two imaginations does not matter.

If somebody has a problem with the definition of an interaction between masses and abstract particles within space, which I called ls-particles (lack of space particles) in my former article, it is better to go from the imagination of an interaction between masses (bound b-particles) and real particles within space, which I called bs-particles in the actual article, whereas a mass causes in its surrounding a lack of bs-particles moving in the direction of their short binding structure. Depending on the mass, the mass should be able to adhere to a certain amount of bs-particles. The more bs-particles moving in the direction of their long binding structure are emitted by a mass, the less bs-particles moving in the direction of their short binding structure are emitted by a certain mass, so that the gradient of space-particle pressure gets stronger in this case, as the relative amount of radially emitted bs-particle moving in the direction of their short binding structure decreases. This means that the gravitational effect of masses is proportional to the number of bs-particles, which are emitted by masses.

Therefore, Newton's law of gravitation is still valid

$$f_g = \frac{m_1 \times m_2}{r^2} \times G. \tag{14}$$

As each mass is producing an own gradient of space-particle pressure, according to the NTG, one could also write

$$f_g = \frac{\Delta P_1 \times \Delta P_2}{r^2} \times G_P. \tag{15}$$

Here, G_P is a constant representing gravitation caused by a gradient of the bs-particle pressure within space. If we put in the usual units for a mass, representing the gradient of space-particle pressure caused by a mass within space, the constant G_P is identical with the gravitational constant G. As a mass or matter has some spatial extension, matter should be flowed through by its own gravitational field moving with the mass. Let us have a look on the matter of the Earth, for which we have to consider that the matter of the Earth on the one hand causes a gravitational field by a lack of bs-particles (moving in the direction of the short binding structure) within its surrounding space and also within the space the Earth is occupying. If the Earth was in a resting position against space, it would be kept by its own gravitational field in this resting position. But as the Earth moves through space with its own gravitational field with a lower number of bs-particles (moving in the direction of the short binding structure) caused by radially emitted bs-particles by the Earth, the Earth is pressed (attracted) in the direction of every new position of the Earth itself, so that the movement goes on for ever, unless the velocity of the Earth in space changes again by the influence of some force. This explanation corresponds with the notion of the so-called inert mass.

As the heavy mass depends from a certain mass and the amount of radially emitted bs-particles and also the inert mass depends from a certain mass and the amount of radially emitted bs-particles, heavy mass and inert mass must be proportional. If a mass is moving around another mass, such as Mercury around the Sun, Mercury, for example, is confronted by more bs-particles (moving in the direction of the short binding structure) coming from outer space and moving in the direction of the Sun, than it would be the case if resting against the Sun, what leads to the well known so-called general relativistic effect with an additional change of the perihelion angular position of Mercury, which I could easily calculate in my former article within a usual three-dimensional space. About the calculation of other so-called general and special relativistic phenomena by the NTG without using relativistic physics see my former article.[2] But by at least two effects, the gradient of the space-particle pressure can be modified, which leads us to the most simple explanations of the so-called dark matter and dark energy.

VI. WHAT IS DARK ENERGY? THE GRADIENT OF THE SPACE-PARTICLE PRESSURE (=GRAVITATION) IS DECREASED BY THE SO-CALLED DARK ENERGY

By the notion "dark energy" one tries to explain recent observations that the universe appears to be expanding at an accelerating rate. If we go from the imagination that photons emitted by a certain mass also "emit bs-particles" themselves, which move on (radially or not radially) right-angled from the path of the photon, additional bs-particles are leaving the area around a mass perpendicular to the radially moving bs-particles emitted by a certain mass. As already defined above, an electromagnetic radiation must consist of bs-particles moving in the direction of the long binding structure, so that the short binding structures are sticking on both sides of the moving bs-particles perpendicular to the direction of the movement of the electromagnetic radiation. Therefore, the bs-particles of space, interacting with the short binding structures of the photon on both sides of the electromagnetic radiation, must lead to an increase of bs-particles emitted perpendicular with respect to the movement of the electromagnetic radiation, which themselves also move in the direction of their long binding structure. The direction of the randomly moving bs-particles near a certain mass is therefore changed by the electromagnetic radiation. Now more bs-particles move tangentially with respect of the mass, which emits the electromagnetic radiation, in the direction of their long binding structure. But the same bs-particles also move radially with respect to the mass in the direction of their short binding structure. Hereby, the spatial area near a mass is partially "filled up" with bs-particles moving radially away from the mass in the direction of their short binding structure, so that the bs-particle pressure gradient causing the gravitational force, as explained above, near a mass gets reduced. This additional contrariwise gravitational effect near a mass that emits photons must therefore reduce the usual gravitational effect of a mass. This means that there results an effect behaving like "antigravitation." As the photons are emitted radially by a certain mass, this additional gravitational effect gets also smaller by the factor $1/r^2$, when the distance from the mass increases. Therefore, there results an additional gravitational effect near a mass that emits photons, which reduces the usual gravitational effect by the factor $1/r^2$. In earlier times of the cosmological development, the density of electromagnetic radiation within space was much higher, so that the gravitational effect between masses got much more reduced by this additional effect, so that the universe should have been expanding much faster shortly after the big bang, which explains the very rapidly explosion of the universe at the beginning, so that the theory of the so-called "inflation" is needless. After the electromagnetic radiation had faded, respectively, had transformed into matter, this effect must have been reduced strongly, so that the usual gravitation between masses got stronger and the expansion of the universe was slowed down. But by the time more and more stars came into being and started to emit electromagnetic radiation, so that by the time the density of electromagnetic radiation increased again, so that also the gravitational effect between the masses was again reduced by the so-called dark energy. This must have caused a seemingly accelerated expansion rate of the universe again, so that this can explain why the universe appears to be expanding at an accelerating rate today. According to the NTG, dark energy is a normal additional gravitational effect of electromagnetic radiation, which causes a reduction of the gravitational effect between masses, so that it seems to act like antigravitation.

VII. THE ELECTROMAGNETIC RADIATION EMITTED BY THE SUN DECREASES THE GRADIENT OF THE BS-PARTICLE PRESSURE (=GRAVITATION) BETWEEN THE SUN AND THE EARTH, CAUSING AN ADDITIONAL INCREASE OF THE ASTRONOMICAL UNIT

Professor C. Laemmerzahl of the University of Bremen in Germany found out that the astronomical unit increases by approximately 7 m per century, which has been established in 2006 by taking into account more than 100 yr of solar system data.[3] This phenomenon can neither be explained by the general relativistic theory of Albert Einstein nor by the Newtonian theory of gravitation. Classical mechanics predicts that the radius of a planetary orbit is larger if the energy E of an elliptical orbit is larger. This means that if the whole energy E of the elliptical planetary orbit is larger by a certain factor, the radius of planetary orbit must be also larger by this factor. As the Sun is emitting energy into space, because of the equivalence of mass and energy the Sun loses mass of about 4.45×10^{12} g/s, which is, in one year, about 1.4043132×10^{20} g

$$\Delta M = 4.45 \times 10^{12} \text{ g} \times 365.25 \times 24 \times 60 \times 60, \quad \Delta M = 1.4043132 \times 10^{20} \text{ g}. \tag{16}$$

This is a relative mass loss of 7.434162×10^{-14} of the mass of the Sun (1.889×10^{33} g)

$$\Delta M = \frac{1.4043132 \times 10^{20} \text{ g}}{1.889 \times 10^{33} \text{ g}}, \quad \Delta M = 7.434162 \times 10^{-14}. \tag{17}$$

According to Newton's mechanics, the whole energy of an elliptical planetary orbit is the same as that of a circular orbit with the diameter of the double major semi axis (a) and is given by the following formula:

$$E = -\frac{GMm}{2a}, \tag{18}$$

If the mass of the Sun is smaller, this means that the whole energy of the elliptical planetary orbit must increase, because of its negative algebraic sign. The median relative loss of mass of the Sun during one rotation of the Earth around the Sun is 3.71731×10^{-14}

$$\Delta M = \frac{0 + 7.434162 \times 10^{-14}}{2} \times M, \quad \Delta M = 3.71731 \times 10^{-14}\, M. \tag{19}$$

The mass therefore changes by the median factor of 0.9999999999999628292 within the time of one revolution of the Earth around the Sun

$$M_2 = 1 - 3.717081 \times 10^{-14} \times M_1, \quad M_2 = 0.9999999999999628292 \times M_1. \tag{20}$$

If the mass of the Sun gets smaller, less basic space particles (bs-particles) can be emitted by the Sun, so that the Sun causes a smaller gradient of bs-particle pressure in its surrounding, so that the gravitational "attraction" of the Sun on the Earth decreases by the median factor 0.9999999999999628292. But although photons are said to have no rest mass, we should expect that photons can also adhere and emit bs-particles, but not in all directions like masses (as the movement of photons is only a linear movement), but only right-angled (radial or not radial) against the movement of a photon. So the photons emitted by the Sun should cause an inverse gravitational effect, as described in the last section. Photons emit bs-particles moving in the direction of their long binding structure right-angled with respect to the movement of the photon, so that the amount of bs-particles moving radially away from the mass in the direction of their short binding structure is increased in the spatial area the photons move through (Fig. 7). This reduces the lack of bs-particles (moving in the direction of the short binding structure) caused by the Sun, which means that the Earth is less attracted by the Sun (more exactly less pressed toward the Sun), so that there results an antigravitational effect on the movement of the Earth. This leads to a deceleration of the Earth on its way around the Sun, so that the whole energy of the elliptical orbit of the Earth must nevertheless increase by the medium factor 0.9999999999999628292 in square. Therefore, the astronomical unit (=r_1) should get larger on average by the median factor (1/0.9999999999999628292)[2]

$$r_2 = \left(\frac{1}{0.9999999999999628292}\right)^2 \times r_1, \quad r_2 = 1.0000000000000007434162 \times r_1. \tag{21}$$

From this, there results a median increase of the astronomical unit (=r_1) of

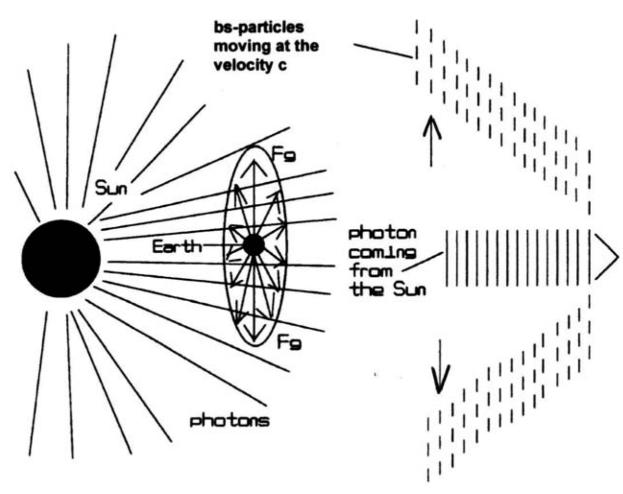

FIG. 7. Photons emit bs-particles moving tangentially in the direction of their long binding structure with respect to the Sun. This increases the amount of bs-particles moving radially in the direction of their short binding structure with respect to the Sun, so that there results an antigravitational effect on the movement of the Earth, so that the Earth is less attracted by the Sun.

$$\begin{aligned}\Delta r &= r_2 - r_1,\\ \Delta r &= r_2 - 1 \times r_1,\\ \Delta r &= 1.00000000000007434162 \times r_1 - 1 \times r_1,\\ \Delta r &= 0.00000000000007434162 \times r_1.\end{aligned} \tag{22}$$

As this median increase of the astronomical unit (=r_1) has to be regarded for the whole revolution of the Earth around the Sun (2π), we have to multiply this value by 2π

$$\begin{aligned}\Delta r &= 0.00000000000007434162 \times r_1 \times 2\pi,\\ \Delta r &= 0.000000000000467102174 4959 \times r_1.\end{aligned} \tag{23}$$

Therefore, we get a increase of the astronomical unit (=r_1) in one year

$$\begin{aligned}\Delta r &= 0.0000000000004671022 \times r_1,\\ \Delta r &= 0.0000000000004671022 \times 149597870000 m,\\ \Delta r &= 0.069877 m.\end{aligned} \tag{24}$$

For the increase of the astronomical unit (=r_1) in one century, we get

$$\begin{aligned}\Delta r &= 0.069877 m \times 100\\ \Delta r &= 6.9877 m.\end{aligned} \tag{25}$$

This value corresponds very well with the observed decrease of about 7 m in one hundred years.[11] This means that the NTG based on the introduced BQT is able to explain the observed increase of the astronomical unit by approximately 7 m per century. According to these considerations, every mass, which emits or reflects electromagnetic radiation, is reducing its gravitational effect a little bit. In my former article "On the new theory of gravitation!" I postulated that this effect should also play a role, if we regard the Earth-Moon-System, what could be described in detail in my latest published article: "Explanation of the Anomalous Secular Increase of the Moon Orbit Eccentricity by the New Theory of Gravitation (NTG)."[4]

VIII. WHAT IS DARK MATTER? AN INDIRECT INCREASE OF THE GRADIENT OF THE BS-PARTICLE PRESSURE (=GRAVITATION) BY SO-CALLED DARK MATTER

The galaxy rotation problem is a discrepancy between the observed rotation speeds of stars in the disk portions of spiral galaxies and the predictions of Newtonian dynamics considering the visible mass. This discrepancy is currently thought to prove the presence of dark matter which permeates the galaxy and extends into the galaxy's halo. According to current theories of gravitation, the rotation rate of galaxies should decrease inversely with the square root of the radius of the orbit, but in reality the rotation rate remains the same, also in orbits which are distant from the center of the galaxy. Neither Newton's theory of gravitation, nor Einstein's general relativistic theory can explain the observed increasing gravitational effect from the inner to the outer regions of a galaxy. To be able to explain the observed increase of the rotation rate proportional to the increase of the radius of the orbit of a galaxy against current theories of gravitation, today's physicists postulate the increase of an invisible mass (dark matter) proportional to the increase of the radius of the orbit. If there are emitted a lot of bs-particles by electromagnetic radiation, such as near the centers of galaxies, especially active centers of galaxies, the antigravitational effect caused by the bs-particles emitted by the electromagnetic radiation should also be able to reduce a not inessential part of the gravitational effect of the masses, as described in Secs. VI and VII. As the electromagnetic radiation emitted radially from the centers of (active) galaxies gets less by the factor $1/r^2$, when the distance from the center of a galaxy increases, the antigravitational effect of the so-called dark matter must also get reduced by the factor $1/r^2$, when the distance from the center of a galaxy increases. This means that the gravitational effects caused by the masses within the center of a galaxy must get stronger by the relative factor r^2, when the distance from the center of a galaxy increases. But as there are still a lot of stars in the periphery of the center of an (active) galaxy, this factor should especially emerge in the outer regions of a galaxy. The gravitational effect squared with respect to distances is proportional to the increase of a mass not squared, so that we have to postulate according to the NTG that there is an increased mass effect of the masses of the central area of a galaxy proportional to the increase of the radius of the orbit of the galaxy. This is exactly the result of the observation and analysis of the rotation rates of galaxies with respect to the radius of the orbit of a galaxy. Let us, for example, assume that the reduced gravitational strength of the masses of a center of an active galaxy 10 000 light-years (relative value 1) distant from the center of the galaxy is 90%, so that there results only a relative gravitational strength of 0.1 in comparison with Newton's theory of gravitation

$$\begin{aligned}F_{g(\mathrm{NTG})} &= F_{g(\mathrm{Newton})} - 0.9 \times F_{g(\mathrm{Newton})}\\ F_{g(\mathrm{NTG})} &= 0.1 \times F_{g(\mathrm{Newton})}.\end{aligned} \tag{26}$$

In this case, we get at the position of a star 50 000 light-years (relative value 5) away from the center of the active galaxy a relative strength in comparison with Newton's theory of gravitation of

$$\begin{aligned}F_{g(\mathrm{NTG})} &= F_{g(\mathrm{Newton})} - \frac{0.9 \times F_{g(\mathrm{Newton})}}{5^2}\\ F_{g(\mathrm{NTG})} &= 0.96 \times F_{g(\mathrm{Newton})}.\end{aligned} \tag{27}$$

This means that from a distance of 10 000 light-years to 50 000 light years, the gravitational effect increases from a relative strength of 0.1–0.96. Not knowing these conditions, one might assume that there must have been a mass increase within the halo of the galaxy in comparison with the center of the active galaxy by about the factor 10. Comparisons of the mass-to-light ratio of our galaxy or near galaxies with the observations of mass-to-light ratios of large galaxy clusters are found to be consistent with dark matter observations in our near galaxies by the measured orbital velocities of galaxies within galactic clusters. But also in this case the NTG is able to explain these observations and also in this case the invisible dark matter is not required to explain the measured orbital velocities of galaxies within galactic clusters by considering the mass-to-light ratios of large galaxy clusters. According to our considerations, dark matter is a hidden indirect gravitational effect, which is nothing else than a combination of two antigravitational effects caused by the so-called "dark energy," which is usually hidden, but which emerges at a certain distance from large masses. Understanding the reason for dark matter, it does not surprise anymore that more dark matter is found on active galaxies (quasars, starburst galaxies, and radio galaxies) than on normal galaxies, as the former emit more electromagnetic radiation.

IX. THE EXPLANATION OF MAGNETISM BY THE BQT IS SIMPLE. THE EXPLANATION OF MAGNETISM BY RELATIVISTIC PHYSICS IS CONTRADICTORY

That a photon (or an electron) emits something (in our case bs-particles) perpendicular to the movement of the photon is not an *ad hoc* hypothesis, but well known: The magnetic field of a photon or of a moving charged source moves perpendicular with respect to the electric field of a photon or of a moving charged source. According to my considerations, a photon or an electromagnetic wave consists of many negative or positive bs-particles moving with the velocity c in the direction of their long binding structure, whereas the largest number of bs-particles within the electromagnetic wave is reached at the vertex of the wave and the lowest number with zero bs-particles is reached between the change of the different charged parts of the electromagnetic wave, each consisting of positive or negative bs-particles.

Regarding the positive or negative bs-particles moving in the direction of their long binding structures, we can see that the reverse "charged" short binding structures stick out perpendicular to the positive and negative bs-particles building up a photon. With the reverse charged short binding structures of a photon, respectively, of electromagnetic radiation, bs-particles from space can interact, whereas they get a spatial orientation, before they move away perpendicular from the photon in the direction of their long binding structure. Therefore, the magnetic field of an electron has its maximum on the vertex of the electric field and is orientated perpendicular with respect to the electric field.

Let us examine, for example, an electron consisting of positive b-particles, but causing a negative electric field consisting of negative bs-particles, as described in detail above. Within the electron the positive b-particles the electron consists of shall be arranged with their positive long binding structure one behind the other. Also in this case the negative short binding structures of the positive b-particles of the electron stick out perpendicular. With the negative short binding structures of the b-particles of an electron negative bs-particles from space can interact, whereas they get a spatial orientation, before they move away perpendicular from the bs-particles of the electron. The bs-particles of a photon and of an electric field, which are ordered according to their spatial orientation parallel with respect to their long binding structures and move in the direction of their long binding structures, represent a relative dense arrangement of parallel ordered bs-particles. These bs-particles can also interact with bs-particles from space with their short binding structures sticking out perpendicular, so that they are able to emit bs-particles moving perpendicular away in the direction of their long binding structures, what causes the magnetic field. This means that a magnetic field is nothing else than an electric field of second order and the density of the parallel arranged bs-particles causing the magnetic field is less in comparison with the density of the parallel arranged bs-particles causing an electric field. But the different "poles" of a magnet or a magnetic field are traditionally not named weak positive or weak negative pole, but "north" and "south" pole.

Today the magnetic force is explained by relativistic physics. To understand the relativistic argumentation, let us examine an electron beam (cathode ray) in a vacuum tube and a metal wire arranged parallel to the electron beam. If there is not an electric current in the metal wire, the electron beam moves straight. If there is an electric current with a flow of electrons in the same direction as the electron beam, the beam is deviated toward the metal wire, and if there is an electric current with a flow of electrons in the opposite direction as the electron beam, the beam is deviated away from the metal wire. The deviation is always caused by a magnetic field resulting perpendicular to the metal wire, if there is a flow of charged electrons. The relativistic argumentation goes as following: If a wire is carrying an electric current and if the electrons move in the same direction as the electron beam, the electrons move relatively slower with respect to the flying electrons of the cathode ray than the protons in the metal wire. Because of the relativistic Lorentz contraction, the electrons in the wire should from the frame of the electrons of the cathode ray be less contracted than the protons. As the negative charges of the electrons shall in this case be larger (less contracted) than the positive charges of the protons, less negative charges shall be able to be arranged one after the other in the metal wire than it is possible for the positive charges of the protons, because also the space between the electrons shall be larger (less contracted). The positive charges shall hereby get predominant and the electrons in the electron beam shall be deflected toward the wire. If the electrons move in the opposite direction within the wire, the electrons move with a relatively higher velocity with respect to the electrons in the cathode ray, than the protons and the negative charges shall in this case be more contracted than the positive charges. As the negative charges of the electrons shall in this case be smaller (more contracted) than the positive charges of the protons, more negative charges shall be able to be arranged one after the other in the metal wire, than it is possible for the positive charges of the protons, because also the space between the electrons shall be smaller (more contracted).

The negative charges within the wire shall hereby get predominant and the electrons of the cathode ray shall be deflected away from the metal wire. However, the relativistic Lorentz contraction must be quite small, if we consider that the electrons move only by the velocity of 1 mm/s = 0.000001 km/s within the metal wire. If there is an electric current with a flow of electrons in the same direction as the electron beam, from the frame of the electrons of the cathode ray, the positive charges of the protons move 0.000001 km/s faster than the negative charges of the electrons within the metal wire.

For the velocity v_{ke} of electrons of the cathode ray against the metal wire we take, for example, 1000 km/s, while velocity v_{we} of the electrons moving within the metal wire is 0.000001 km/s. The difference between the Lorentz contraction of the moving negative charges and the resting positive charges, whereas the contraction value without an electric current is Lo = 1, within the metal wire is only

$$\begin{aligned}\Delta L &= L_o(\textit{negative charge}) \times \sqrt{1-\frac{(v_{ke}-v_{we})^2}{c^2}} \\ &\quad - L_o(\textit{positive charge}) \times \sqrt{1-\frac{{v_{ke}}^2}{c^2}} \\ \Delta L &= L_o(\textit{negative charge}) \\ &\quad \times \sqrt{1-\frac{(1000\ \mathrm{km/s}-0.000001\ \mathrm{km/s})^2}{(299792.458\ \mathrm{km/s})^2}} \\ &\quad - L_o(\textit{positive charge}) \\ &\quad \times \sqrt{1-\frac{1000\ \mathrm{km/s}^2}{299792.458\ \mathrm{km/s}^2}} \\ \Delta L &= L_o(\textit{negative charge}) \times 0.9999443673425589 \\ &\quad - L_o(\textit{positive charge}) \times 0.9999443673424477 \\ \Delta L &= 1.112 \times 10^{-14} L_o.\end{aligned} \tag{28}$$

This means that from the sight or frame of an electron of the cathode ray the relative difference of the largeness between the positive charges and the negative charges is 1.112×10^{-14}. Within a qcm of a metal wire, there are about 10^{23} electrons and therefore also 10^{23} negative charges. According to relativistic physics, we would expect that by the movement of the electrons in the metal wire in the same direction as the electrons of the cathode ray, the electrons in the cathode ray should be confronted by 1.112×10^{9} more positive charges, so that the cathode beam gets deflected toward the metal wire

$$\begin{aligned}\Delta \textit{positive charges}^+ &= 1.112 \times 10^{-14} \\ &\qquad \times 10^{23} \times \textit{positive charges}^+ \\ \Delta \textit{positive charges}^+ &= 1.112 \times 10^{9} \\ &\qquad \times \textit{positive charges}^+.\end{aligned} \tag{29}$$

By the movement of the electrons in the metal wire in the opposite direction as the electrons of the cathode ray, the electrons in the cathode ray should be confronted by 1.112×10^{9} more negative charges, so that the cathode beam gets deflected away from the metal wire. But the argumentation of relativistic physics contains some important contradictions: Let us take the example, when the negative charges (electrons) in the metal wire move in the same direction as the electrons of the cathode beam. In this case, relativistic physics argues that the negative charges and the distances, respectively, the space, between the negative charges are less contracted from the sight or frame of the electrons in the cathode ray.

But only the electrons (negative charges) move within the metal wire, but not the space itself between the negative charges, as the space between the negative charges is identical with the space, which is occupied by the metal wire, which does not move with the negative charges. Therefore, the space between the negative charges cannot be less contracted and therefore the distances between the negative charges cannot be larger. Even if we ignore this contradiction and follow the argumentation of relativistic physics, there arise further contradictions. If the negative charges and the distances (the space) between the negative charges are less contracted, what means that the negative charges and the distances are larger than if there is not an electric current, the not enlarged metal wire would not be able to carry all the larger negative charges and the spaces between the negative charges, so that the spaces between the negative charges and the negative charges do not have enough place anymore within the metal wire. In this case, the negative charges and the spaces between the negative charges must get "pressed out" of the metal wire. That negative charges are leaving the metal wire is imaginable, but that the space of a metal wire should come out of a metal wire is not imaginable. And if the negative charges and the distances (the space) between the negative charges were less contracted, there would exist two different spaces within the metal wire. One space, in which the negative charges move and one separate space, in which the positive charges move, as the space, in which the negative charges move is contracted less, than the space, in which the positive charges move.

According to my "forbidden" nonrelativistic considerations, the negative and the positive electric field (consisting of negative and positive bs-particles) emitted by the electrons or the positrons within the metal wire are spreading from the electrons or positrons with the velocity c. If the electrons in the metal wire move with the velocity of 1 mm/s in the same direction as the electrons of the cathode ray, the negative bs-particles of negative electric field move behind the electrons of the cathode ray, so that the electrons from the cathode ray meet less negative bs-particles, than if there was not a electric current and the electrons in the metal wire did not move. If there is no electric current in the metal wire and the electrons and the protons do not move within the wire, from the velocity v_{ce} of the electrons of the cathode ray and from the electric field spreading with the velocity c, we get for the velocity of the electrons of the cathode against the bs-particles of the electric fields spreading from the electrons and protons in the metal wire the same value

$$v = \sqrt{(c)^2 + (v_{ec})^2}. \tag{30}$$

If there is an electric current and the electrons, but not the protons are moving in the metal wire in the direction of the electrons of the cathode ray, we have to subtract from the velocity v_{ce} of the electrons of the cathode ray the velocity v_{we} of the electrons moving within the metal wire, because the negative bs-particles causing the negative electric field have in this case to move behind the electrons of the electrons in the cathode ray, so that we get for the velocity of the electrons of the cathode ray against the negative bs-particles of electric field spreading from the electrons in the metal wire

$$v' = \sqrt{(c)^2 + (v_{ec} - v_{ew})^2}. \tag{31}$$

Putting in for the velocity v_{ke} of the electrons of the cathode ray a certain velocity, for example, 1000 km/s, we get

$$\begin{aligned} v' &= \sqrt{(c)^2 + (v_{ec} - v_{ew})^2} \\ v' &= \sqrt{(c)^2 + (1000\ \text{km/s} - 0.000001\ \text{km/s})^2} \\ v' &= \sqrt{(299792.458\ \text{km/s})^2 + (0.999999\ \text{km/s})^2}. \end{aligned} \tag{32}$$

For the difference between v′ and v we get, if we put in for velocity v_{ke} of the electrons of the cathode ray again 1000 km/s

$$\begin{aligned} \Delta v &= v' - v = \sqrt{(c)^2 + (v_{ec} - v_{ew})^2} \\ &\quad - \sqrt{(c)^2 + (v_{ew})^2} \\ \Delta v &= \sqrt{(c)^2 + (1000\,\text{km/s} - 0.000001\,\text{km/s})^2} \\ &\quad - \sqrt{(c)^2 + (1000\,\text{km/s})^2} \\ \Delta v &= \sqrt{(299792.458\,\text{km/s})^2 + (999.999999\,\text{km/s})^2} \\ &\quad - \sqrt{(299792.48)^2 + (1000\,\text{km/s})^2} \\ \Delta v &= 299794.1258158334296\,\text{km/s} \\ &\quad - 299794.1258158367652\,\text{km/s} \\ \Delta v &= -3.3356 \times 10^{-9}\,\text{km/s}. \end{aligned} \tag{33}$$

Because of the slower velocity of the electrons of the cathode ray, the electrons of the cathode ray must meet less negative charges, so that the cathode ray gets deflected toward the metal wire. We get the difference for the amount of negative bs-particles the electrons of the cathode ray meet, if we put in the relative value 1 for the amount of negative bs-particle, when there is not an electric current

$$\begin{aligned} \Delta bs - particles^- &= 1 \times (bs - particles^-) \\ &\quad \times \frac{299794.1258158334296\ \text{km/s}}{299794.1258158367652\ \text{km/s}}) \\ &\quad - 1 \times (bs - particles^-) \\ \Delta bs - particles^- &= 0.999999999999988873 \\ &\quad \times (bs - particles^-) \\ &\quad - 1 \times (bs - particles^-) \\ \Delta bs - particles^- &= -1.11263 \times 10^{-14} \\ &\quad \times bs - particles^-. \end{aligned} \tag{34}$$

As the amount of bs-particles is proportional to the amount of charges, according to my considerations in our example, the electrons of the cathode ray meet by the factor 1.11263×10^{-14} less negative charges (negative bs-particles), what means that the electrons of the cathode ray meet by the factor 1.11263×10^{-14} more positive charges (positive bs-particles). For the larger amount of positive charges the electrons of the cathode ray meet, we get per qcm metal wire

$$\begin{aligned} \Delta positive\ charges^+ &= 1.11263 \times 10^{-14} \\ &\quad \times 10^{23} \times positive\ charges^+ \\ \Delta positive\ charges^+ &= 1.11263 \times 10^{9} \\ &\quad \times positive\ charges^+. \end{aligned} \tag{35}$$

If there is an electric current and the electrons, but not the protons are moving in the metal wire in the opposite direction of the electrons of the cathode ray, we have to add to the velocity v_{ce} of the electrons of the cathode ray the velocity v_{we} of the electrons moving within the metal wire, because the negative bs-particles causing the negative electric field moves in this case against the electrons of the electrons in the cathode ray, so that we get for the velocity of the electrons of the cathode ray against the negative bs-particles of electric field spreading from the electrons in the metal wire

$$v' = \sqrt{(c)^2 + (v_{ec} + v_{ew})^2}. \tag{36}$$

Putting in for the velocity v_{ke} of the electrons of the cathode ray a certain velocity, for example, 1000 km/s, we get

$$\begin{aligned} v' &= \sqrt{(c)^2 + (v_{ec} + v_{ew})^2} \\ v' &= \sqrt{(c)^2 + (1000\,\text{km/s} + 0.000001\,\text{km/s})^2} \\ v' &= \sqrt{(299792.458\,\text{km/s})^2 + (1000.000001\,\text{km/s})^2}. \end{aligned} \tag{37}$$

For the difference between v′ and v, we get if we put in for velocity v_{ke} of the electrons of the cathode ray again 1000 km/s

$$\begin{aligned} \Delta v &= v' - v = \sqrt{(c)^2 + (v_{ec} + v_{ew})^2} \\ &\quad - \sqrt{(c)^2 + (v_{ew})^2} \\ \Delta v &= \sqrt{(c)^2 + (1000.000001\ \text{km/s})^2} \\ &\quad - \sqrt{(c)^2 + (1000\ \text{km/s})^2} \\ \Delta v &= 299794.1258158401008\ \text{km/s} \\ &\quad - 299794.1258158367652\ \text{km/s} \\ \Delta v &= +3.3356 \times 10^{-9}\ \text{km/s}. \end{aligned} \tag{38}$$

Because of the faster velocity, the electrons of the cathode ray; the electrons of the cathode ray must meet more negative charges, so that the cathode ray gets deflected away from the metal wire. We get the difference the for the amount of negative bs-particles the electrons of the cathode ray meet, if we put in the relative value 1 for the amount of negative bs-particle, when there is not an electric current

$$\begin{aligned}\Delta bs-particles^{-} &= \left(1\times bs-particles^{-}\right.\\&\left.\times\frac{299794.1258158401008\,\text{km/s}}{299794.1258158367652\,\text{km/s}}\right)\\&-1\times(bs-particles^{-})\\\Delta bs-particles^{-} &= (1.000000000000011263\times 1\\&\times bs-particles^{-})\\&-1\times(bs-particles^{-})\\\Delta bs-particles^{-} &= 1.11263\times 10^{-14} bs-particles^{-}.\end{aligned} \tag{39}$$

As the amount of bs-particles is proportional to the amount of charges, according to my considerations in our example, the electrons of the cathode ray meet by the factor 1.11263×10^{-14} more negative charges (negative bs-particles), what means that the electrons of the cathode ray meet by the factor 1.11263×10^{-14} more negative charges (negative bs-particles). For the larger amount of positive charges the electrons of the cathode ray meet, we get per qcm metal wire

$$\begin{aligned}\Delta negative\ charges^{-} &= 1.11263\times 10^{-14}\\&\times 10^{23}\times negative\ charges^{-}\\\Delta negative\ charges^{-} &= 1.11263\times 10^{9}\\&\times negative\ charges^{-}.\end{aligned} \tag{40}$$

According to relativistic physics and also according to my considerations by a flow of negative charges in a metal wire electrons of a cathode ray (moving with the velocity of 1000 km/s) are confronted by about 1.112×10^{9} additional positive or negative charges per qcm of a metal wire, what causes the magnetic effect. The results of relativistic physics and of my considerations are the same. The derivation of magnetism by relativistic physics is vaguely and contradictory. But according to relativistic physics, my considerations are forbidden, because of the postulated invariance of the velocity c.

X. WHAT IS THE REASON FOR THE SO-CALLED CASIMIR EFFECT?

The Casimir effect emerges if two uncharged metallic plates in a vacuum are placed a few dozen nanometers apart. In this arrangement, it happens that the two metallic plates get pressed toward each other. The Casimir effect can be described by the quantum field theory, which postulates that all of the various fundamental fields, as the electromagnetic field, must be quantized at each and every point in space. But also according to the BQT introduced here, we have to postulate an effect known as the so-called Casimir effect: According to the BQT, the vacuum is filled up with negative and positive bs-particles. If there are two metallic plates placed very close to each other, the electrons moving within the electric conductor (metal plates) to and fro are hit by more bs-particles from outside than from between the metallic plates, as the moving electrons can keep some of the bs-particles away from the space between the metallic plates. Hereby, the relative amount of bs-particles outside the metallic plate increases. This results in a larger bs-particle space pressure from outside the metallic plates, while the bs-particle space pressure between the metallic plates gets reduced. Therefore, the metallic plates must be pressed toward each other. If the metallic plates are not very close to each other the effect disappears, because now the electrons cannot keep the bs-particles away from the space between the metallic plates, so that the bs-particle space pressure does not differ between inside and outside the metallic plates. Two plates of non electric conductors cannot cause an effect like the Casimir effect, as the electrons are bound to the atoms, so that the electrons cannot move within the material of the plates and therefore cannot keep bs-particles away from the space between the plates.

XI. UNIFICATION OF THE WEAK (NUCLEAR) FORCE AND THE ELECTROMAGNETIC FORCE WITH THE GRAVITATIONAL FORCE

As pointed out above, the weak (nuclear) force is caused by the weak binding force of b-particles. The relative value for the weak binding force with the coupling constant $\boldsymbol{\alpha}_{\mathbf{W}}$ we could calculate from the coupling constant $\boldsymbol{\alpha}$ of the electromagnetic force

$$\alpha_W = \sqrt[3]{(\alpha)}. \tag{41}$$

But this equation is only correct, if we used for the relative strength of the electromagnetic force a value, which is a multiple of the weak binding force. As we use for the relative strength of the electromagnetic force a value compared with the strong nuclear force, we must use the following equation:

$$\begin{aligned}\alpha_W &= (\alpha)^{3}\\&= \left(\frac{1}{137.036}\right)^{3} = 3.886\times 10^{-7} \approx 3.9\times 10^{-7}.\end{aligned} \tag{42}$$

While the electromagnetic force gets stronger, the more bs-particles^{-} or bs-particles^{+} are emitted by a charged particle, gravitation behaves inverse proportional: If less bs-particles are emitted by a mass (moving in the direction of their short binding structure), the gravitational force gets stronger. Therefore, the coupling constant $\boldsymbol{\alpha}_{\mathbf{g}}$ of the gravitational force must be weaker than the coupling constant $\boldsymbol{\alpha}_{\mathbf{W}}$ of the weak binding force, which we derived from the coupling constant $\boldsymbol{\alpha}$ of the electromagnetic force. While an electric field and the electromagnetic force are caused by the emission of only one sort of bs-particles, bs-particles^{-} or bs-particles^{+}, gravitation is caused by both kinds of bs-particles. If we want to compare the coupling constant $\boldsymbol{\alpha}_{\mathbf{g}}$ of the gravitational force with the coupling constant $\boldsymbol{\alpha}_{\mathbf{W}}$ of the weak binding force, the value for the coupling constant $\boldsymbol{\alpha}_{\mathbf{W}}$ has to be squared

$$\alpha_g = (\alpha_W)^2$$
$$\alpha_g = (3.9 \times 10^{-7})^2 = 1.5 \times 10^{-13}. \quad (43)$$

As the weak binding force is a "one-dimensional force," while the gravitational force is a "three-dimensional force," because it is distributed within three-dimensional space, we can derive the coupling constant $\boldsymbol{\alpha_g}$ of the gravitational force from the coupling constant $\boldsymbol{\alpha_W}$ of the weak binding force by the equation

$$\alpha_g = [(\alpha_W)^2]^3 = (1.5 \times 10^{-13})^3 = 3.375 \times 10^{-39}. \quad (44)$$

As pointed out in my former article "On the New Theory of Gravitation"[2] in detail, for the gravitational force we must consider the concept of the cross section, whereas the cross section of a particle (mass) is a value for the effective area for an interaction between bs-particles (former ls-particles) and the material structures (bound b-particles) of the particle. As the cross section of a spherical target is given by

$$\sigma = \pi \times r^2. \quad (45)$$

And as the relative value of the radius is 1, the relative value of the cross sections as the effective areas for collision of the particle is given by

$$\sigma = \pi \times 1^2$$
$$\sigma = \pi. \quad (46)$$

As this factor π for the cross section of particles is a basic quality, by which matter resting macroscopically (for example, in the gravitational field of the Earth) must be defined, the additional gravitational factor π must be already enclosed in the Newtonian constant of gravitation. But for our theoretical derivation of the gravitational force (which is a three-dimensional force) from the weak binding force (which is a one-dimensional force), the cross section concept must be considered to get the correct relative strength of the gravitational force. To get the correct relative strength of the coupling constant $\boldsymbol{\alpha_g}$ of the gravitational force, we have to multiply the calculated relative value with the value for the cross section (π), so we get for the derived relative value of coupling constant $\boldsymbol{\alpha_g}$ of the gravitational force

$$\alpha_g \approx 3.375 \times 10^{-39} \times \pi \approx 1 \times 10^{-38}. \quad (47)$$

This calculated value for the relative strength corresponds very well with the usually given value of today's physics for the relative strength of the gravitational force of 1×10^{-38}. By the BQT, we could also unify the electromagnetic and the weak binding force with the gravitational force, which confirms again the imaginations introduced in this article.

XII. CORRECT INTERPRETATION OF THE SO-CALLED ALLAIS EFFECT

The so-called Allais effect is a real effect, which can periodically be observed during a solar eclipse.[1] The observation of the Allais effect presupposes that the gravitational interaction must be an indirect effect. Only if during a solar eclipse bs-particles "emitted" by the Sun and causing the gravitational effect pass the moon without being completely absorbed or exchanged (as it is thought by today's physics) on their way toward the Earth, some kind of gravitational interference can occur, by which the Allais effect must be explained. Some of the bs-particles coming from the Sun should therefore be able to "collide" with the intraelemental material structures of the Moon, so that some of the bs-particles should get deflected on their way from the Sun toward the Earth. By this mechanism, it should be possible to observe gravitational effects of interference. While the Moon is moving in front of the Sun on the first half of the eclipse, some of the bs-particles will get deflected by the Moon. As the bs-particles moving in the direction of their short binding structures have a higher probability to meet the mass of the Moon than bs-particles moving in the direction of their long binding structure, more bs-particles moving in the direction of their short binding structure must get deviated in comparison with bs-particles moving in the direction of their long binding structure. This means that less bs-particles moving in the direction of their short binding structure coming from the Sun will arrive the Earth, what decreases the pressure of bs-particles coming from the Sun in the direction of the Moon, causing as seemingly higher gravitational effect of the Moon on the pendulum, so that the pendulum swinging at a certain azimuth angle changes its swinging direction toward the Moon and the oscillation period of the pendulum decreases somewhat. This effect is back to front for an observer on the other side of the Earth. On the last half of the eclipse, some of the bs-particles will get also deflected by the Moon, so that less bs-particles moving in the direction of their short binding structure coming from the Sun will arrive the Earth, what decreases the pressure of bs-particles coming from the Sun in the direction of the Moon, causing again a seemingly higher gravitational effect of the Moon on the pendulum, so that the pendulum swinging at a certain azimuth angle changes its swinging direction toward the Moon and the oscillation period of the pendulum decreases somewhat. This effect is back to front for an observer on the other side of the Earth, see Fig. 8, where the distortion of the azimuth angle is presented by a simplified graphical schema. If a pendulum is swinging directly in the direction of the solar eclipse, there could not occur a distortion of the azimuth angle, but only a deceleration of the swinging of the pendulum, which is called the Jeverdan-Rusu-Antonescu-effect. This means that the BQT is able to explain the Allais effect, as well as the so-called the Jeverdan-Rusu-Antonescu-effect.

XIII. THE PLANCK CONSTANT CAN ALSO BE DERIVED FROM THE WEAK BINDING FORCE, WHICH SUPPORTS THE BQT INTRODUCED HERE

From the relative value of the weak binding force (which causes the weak nuclear force), we can directly calculate the Planck constant. According to our considerations, the charged area of a charged particle, respectively, an electron or positron, is interacting with its bound b-particles with one sort of free bs-particles of space by adhering bs-particles,

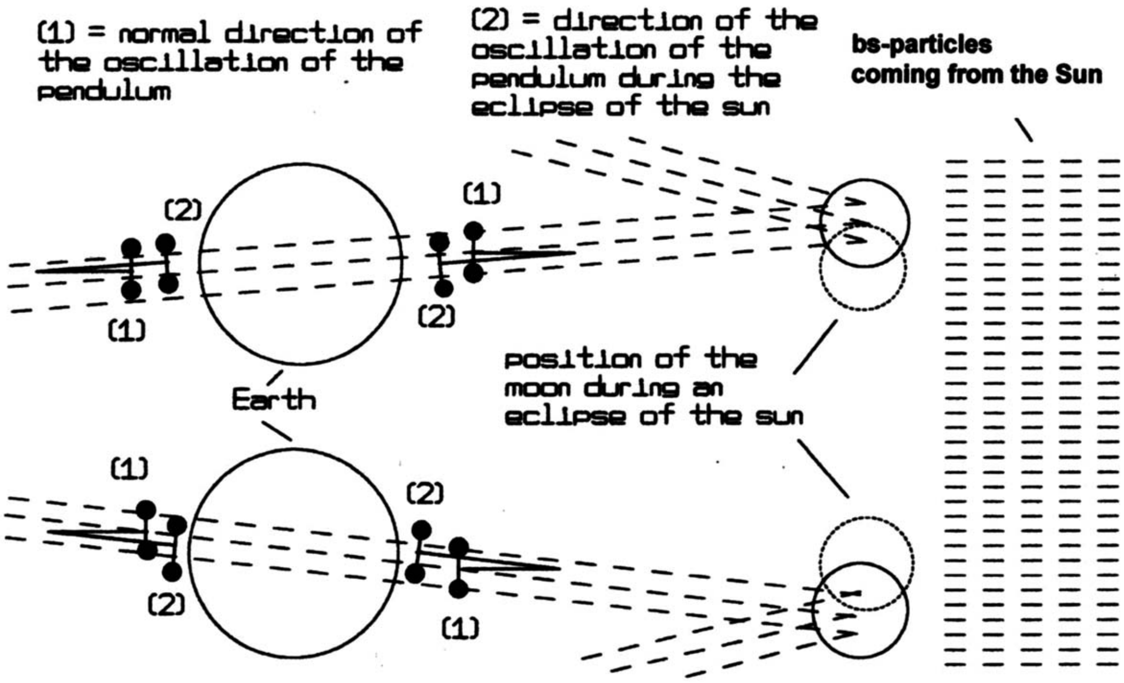

FIG. 8. Simplified graphical scheme explaining the Allais effect by bs-particles "coming" from the Sun, which get deflected by the atoms of the moon during a solar eclipse.

which after a certain time are leaving the electron or positron again into space. The strength of interaction between the bound b-particles of the charged particles and the free bs-particles of space is represented by the strength of the weak binding force. The leaving bs-particles represent the half of the strength of this interaction, so that we get for the relative strength of the weak binding force represented by the bs-particles leaving a charged particle, for example, an electron

$$\frac{\alpha_W}{2} \approx \frac{4 \times 10^{-7}}{2} \approx 2 \times 10^{-7}. \tag{48}$$

To be able to leave the charged particle, respectively, the electron or positron as an electromagnetic wave, the packets of bs-particles must get arranged in a three-dimensional order. The amount of free bs-particles leaving the electron or positron therefore must distribute within a certain three-dimensional area of space, what means that the strength of the weak binding force can be also considered to be distributed within this certain three-dimensional area of space, so that we get for the relative strength of the smallest energy quantum leaving a charged particle, an electron or positron, in comparison with the relative strength of the strong nuclear force a value of

$$\text{Energy Quantum}_{relative\ strength} = (2 \times 10^{-7})^3 \times t = 8 \times 10^{-21} \times t. \tag{49}$$

To get the correct value for the Planck Constant, representing the absolute value of the smallest quantum energy, we have to multiply the relative value of the smallest quantum energy by the mass of the electron or the positron, which represents the amount of bound b-particles the electron or positron (and also the charged area of another charged particle) consists of, which interact with the free bs-particles of space, so that we get for the Planck Constant

$$\begin{aligned}\text{Planck Constant} &\approx 8 \times 10^{-21} \times t \times 0.511 \times 10^{6}\ \text{ev}\\ \text{Planck Constant} &\approx 4.1 \times 10^{-15}\ \text{ev} \times \text{t}.\end{aligned} \tag{50}$$

This value corresponds very well with the value given for the Planck Constant:

$$\text{Planck Constant} = 4.135667 \times 10^{-15}\ \text{ev s}. \tag{51}$$

XIV. CRITIQUE OF THE NTG

One might criticize that a mass, which moves through space, should be confronted in front by a higher bs-particle pressure of space than at the back, so the mass should be slowed down, what cannot be observed. In classical mechanics, the impulse p is defined as the product between the mass of a body and the velocity of the body. But the bs-particles moving through space do not have a mass, as they usually do not interact with other bs-particles moving through space, so that they cannot cause themselves a gravitational effect. The introduced difference of space pressure within certain space areas must have another cause. If the short and long binding structures of bs-particles of a different algebraic sign and long binding structures of bs-particles of the same algebraic sign can adhere to bound b-particles of particles (or electromagnetic waves), this is only possible by a certain direct attraction between the involved structures. In most cases, the bs-particles will not adhere to b-particles, but only touch the b-particles, causing a certain pull in the direction of the movement. If a bs-particle moves faster against a certain mass, the pull on a bound b-particle will last shorter. And if a bs-particle moves slower against a certain mass, the pull on a bound b-particle will last longer. On the whole, the pull on bound b-particles will have always the same strength. Considering a mass moving through space, the bound b-particles of the mass are confronted in front and at the back by the same pull in the opposite direction than the moving direction of the free bs-particles, so that the mass will not slowed down. By the described pull between free bs-particles and bound b-particles also the intraelemental movement of structures within an elemental particle cannot be slowed down. That their must be an intraelemental movement is described by the abstract term "spin" used by quantum mechanics. The name spin has historical reasons, but there is nothing which spins, as we would expect it from our macroscopic experiences. Quantum mechanics can describe spin, but it can explain it only by using mathematical structures, which reflect how spin behaves. But pure mathematical structures and a mathematical movement cannot exist in reality, so that there must exist some kind of a real movement of intraelemental particular structures. As already described in my former articles,[2,6] the velocity of electromagnetic radiation or intraelemental particular structures must be determined by the minimum energy principle, so that I could explain the so-called special relativistic effects without using relativistic imaginations. The basic consideration was that for the reason of the minimum energy principle, electromagnetic radiation or intraelemental particular structures must always move with the velocity c with respect to the predominating gravitational field, what means that the intraelemental particular structures cannot be slowed down by the bs-particle pressure of space but must keep the velocity c. This is also the reason why electrons moving "around" a nucleus of an atom must keep the velocity c and do not fall into the nucleus, as classical physics did expect it.

In today's quantum physics, an electron bound to a nucleus of an atom behaves like a wave and Schrödinger's equation describes an electron as a wavefunction, which could be used to calculate the probability of finding an electron at any given location around the nucleus. According to this imagination, an electron can potentially be found at a certain atomic orbital. Each atomic orbital has its own set of quantum numbers such as energy, angular momentum, and projection of angular momentum, and only a discrete set of these orbitals exist around the nucleus. According to the Pauli exclusion principle, each atomic orbital can be occupied by up to two electrons, which must differ in their spin quantum number. According to my considerations, the intraelemental structures of electrons with the same spin (certain intraelemental movement) would collide, so that only electrons with a different spin can occupy a certain atomic orbital. The calculations of quantum physics can describe an atomic set of orbitals with their electrons quite perfect, but it does not really explain why electrons bound to an atom cannot fall into the nucleus. The context between the minimum energy principle and the movement with the velocity c of electromagnetic radiation and intraelemental particular structures within a predominating gravitational field, which causes the so-called special relativistic phenomena, is in detail pointed out in my article "Calculation of so-called special relativistic phenomena on the basis of the minimum energy principle maintaining classical conceptions of relativity" in *Physics Essays Essays*.[6]

XV. THE NTG CAN EXPLAIN SO-CALLED SPECIAL RELATIVISTIC PHENOMENA LIKE THE SO-CALLED TIME DILATATION OR RELATIVISTIC MASS INCREASE

In this context, I have to refer to my articles in *Physics Essays*: "Calculation of so-called special relativistic phenomena on the basis of the minimum energy principle maintaining classical conceptions of relativity"[6] and "On the new theory of gravitation."[2] In both articles, I pointed out how it is possible to predict all relevant so-called special relativistic phenomena maintaining classical conceptions of an Euclidean space and the Galileian principle of relativity. The NTG recognizes that so-called special relativistic effects result by the movement of electromagnetic radiation or intraelemental particular structures within a gravitational field. According to my considerations, a photon or an electromagnetic radiation would meet more bs-particles moving in the direction of their short binding structure within a gravitational field, if the photon (electromagnetic radiation) had a faster or slower velocity than c ("velocity of light"), so that the velocity c is a preferable velocity for the photon with respect to the minimum energy principle. Einstein's theory of special relativity can explain and calculate the so-called special relativistic phenomena with the same precision as the NTG of the author, but while Einstein calculates the special relativistic phenomena by the movement within a certain coordinate system (inertial systems) and within time, which both do not exist as real physical entities, the NTG calculates the so-called special relativistic effects by the movement within real existing gravitational fields. Einstein's theory must therefore be regarded as an unrealistic physical theory with precise mathematical results.

XVI. CALCULATION OF SO-CALLED GENERAL RELATIVISTIC PHENOMENA

In my former articles in *Physics Essays*: "Calculation of so-called general relativistic phenomena by advancing Newton's theory of gravitation maintaining classical conceptions of space and relativity."[7] and "On the new theory of gravitation,"[2] I pointed out how it is possible to predict general relativistic phenomena maintaining classical conceptions of an Euclidean space and the Galileian principle of relativity, such as the additional precession of the perihelion of Mercury, the bending of light by a mass like the Sun, the so-called general relativistic phenomena observed at the binary pulsar PSR 1913 + 16, and other so-called general relativist effects. But now we are able to understand the so-called general relativistic phenomena even better: When Mercury moves around the Sun or the pulsars around each other, they meet more bs-particles moving in the direction of their short binding structures coming from the opposite side than the mass of the Sun or the masses of the pulsars. This enlarges the gravitational pressure on Mercury or on the pulsars, which causes an acceleration of Mercury toward the Sun or the pulsars toward each other. Today this so-called general relativistic effect is in the case of the binary pusar

PSR 1913 + 16 explained by the emission of so-called gravitational waves. Gravitational waves are described as distortions of the postulated space-time.

The observed phenomena at the binary pusar PSR 1913 + 16 are by some physicists even used to assert that the existence of gravitational waves are proofed indirectly, not noticing that they use a circular argument. In March 2014, scientists of the Harvard-Smithsonian Center for Astrophysics asserted that they had been able to detect gravitational waves in the form of small patterns in the cosmic microwave background. Although this phenomenon can surely be interpreted in different ways, a detailed analysis of the data collected and of the measurement method showed that the conclusions were too far-reaching, so that they had to take back their assertion. That they asserted to have found a "direct evidence" for the gravitational waves is already a hint for a tendency of established physics to too far-reaching conclusions. The pressure to succeed is very high for the scientists, as they spend a lot of money for their experiments, so that there is a tendency to interpret vague indications as evidence. I hope that in the end not artifacts are used as evidence. Despite great and expensive experimental efforts to prove gravitational waves, they could not be detected yet directly. We should know now why they still could not be detected directly.

The correct values of so-called general relativistic effects can either be calculated by the NTG within a three-dimensional space by very simple mathematics or by Einstein's theory of gravitation within a four-dimensional space-time by very complicated mathematics. In the case of the Pioneer anomaly, the Pioneer spacecraft, which moves away from us, meets more bs-particles moving in the direction of their short binding structure, coming from outside of our solar system. This causes a higher bs-particle pressure on the Pioneer spacecraft from outside the solar system, what can be measured as an acceleration of the Pioneer spacecraft against the Sun, as calculated also in my former article. This effect is often negated, because there does not exist a plausible explanation. The NTG considers that so-called general relativistic effects result by the movement of masses and (in certain cases of electromagnetic radiation) within a gravitational field. Einstein's theory of general relativity can explain and calculate the so-called general relativistic phenomena with the same precision as the NTG of the author, but while Einstein calculates the special relativistic phenomena by the movement within a certain coordinate system (inertial systems) and within time, which both do not exist as real physical entities, the NTG calculates the so-called general relativistic effects by the movement within real existing gravitational fields. Einstein's theory must therefore be regarded as an unrealistic physical theory with precise mathematical results.

XVII. WHY THE VELOCITY OF LIGHT SEEMS TO BE INVARIANT AND WHY THERE DOES NOT EXIST A GRAVITATIONAL ABERRATION, SO THAT GRAVITATIONAL FORCE SEEMS TO ACT INSTANTANEOUSLY

Special relativistic physics refers in respect of the postulated invariant velocity of light to some experiments and examinations, for example, the experiment of Michelson and Morley,[8,9] the experiment of Alväger *et al.*[10] But the Michelson and Morley experiment and the experiment of Alväger can be taken also as a proof that the velocity of light is orientating on the predominating gravitational field of the Earth, which is moving with the Earth through space, but not rotating with the Earth. Another argument, which is also often mentioned in order to show the correctness for the assertion that the velocity of light is invariant, is the fact that light beams emitted by elemental particles, moving within atoms or emitted by oscillating atoms, have always the same frequency. This can be explained by going from the same assumption pointed out in the context of the emission of bs-particles, that is to say, that light beams are always emitted right-angled with respect of the total vector of velocity of the caloric oscillation of atoms or of the movement of elemental particles and the intraelemental particular motion within atoms. In this case, the emitted light beam would always have the same wave-length and frequency.

Van Flandern correctly concludes in his article in 1998 "The speed of gravity—What the experiments say" that gravity has no aberration.[11] Going from the consideration of equivalent observation standpoints, the spread of gravity at the velocity c should cause an aberration. He deduces that the velocity of gravity should be about $10^{10}c$ or more, which could explain why in the case of gravity we do not observe the so-called phenomenon of aberration. On the one hand, the velocity of $10^{10}c$ contradicts special relativity, and on the other hand, this is a quite unimaginably fast velocity. Van Flandern fails to consider that gravitation must always have a spatial orientation in the direction of the source and he compares the movement of "gravitons" (in our case of bs-particles) with the movement of photons, not taking into account that the photon's velocity c should be orientated toward predominant gravitational fields and not toward observation viewpoints, while the bs-particles' movement is not influenced by gravitational fields, as they cause the gravitational field themselves. Why we can observe the so-called phenomenon of aberration in the case of moving photons, but we cannot see an aberration for the gravitational interaction is described in detail in my former article "On the new theory of gravitation."[2]

XVIII. THAT THE VELOCITY OF LIGHT ORIENTS ON PREDOMINATING GRAVITATIONAL FIELDS IS NOT AN *AD HOC* HYPOTHESIS, BUT IS PROOFED BY EXPERIMENTS

By the experiment of Hafele and Keating[12] in 1972, it could be shown that atomic clocks within airplanes are influenced by the velocity of the airplanes against the surface of the Earth. The velocity of the airplanes on their flight over 50 h was 800 km/h on the average. One time the airplane flew with the rotation of the Earth toward the east ($v_E = 1667\,\text{km/h} + 800\,\text{km/h} = 2467\,\text{km/h}$) and another time the airplane flew against the rotation of the Earth toward the west ($v_W = 1667\,\text{km/h} - 800\,\text{km/h} = 867\,\text{km/h}$). If one subtracts the so-called "gravitational effect on time" in dependence from the altitude of the flights, during the flight against the east, the atomic clocks went 255 ns slower (-255 ns) than the atomic clocks on the surface of the Earth and during the flight against the west the atomic clocks went 156 ns faster ($+156$ ns) than the atomic clocks on the surface of the Earth.

As the rotation of the Earth does not influence the flight of an airplane, one would expect that the influence of the velocity of the airplanes on the atomic clocks in the airplanes would be the same for the flight toward the east and toward the west, if one uses the imagination of relativistic physics that motion is always relative. But instead of latter imagination, the physicists had to go from the reference point of an observer, who is in a resting position against the rotation of the Earth. This reference point is not any relative point, but a very special reference point what contradicts the idea of relativistic physics. The observer in a resting position against the rotation of the Earth is a theoretical construct to calculate the values, which could be measured with the atomic clocks in the airplane. But neither this theoretical construct exists in reality nor the relativistic construct of inertial reference frames to calculate so-called relativistic phenomena.

The question arises what exists in reality? Gravitation is a real phenomenon and "gravitational fields" are real! In the case above, it is the predominating gravitational field of the Earth, which does not rotate with the Earth. Therefore, the experiment of Hafele and Keating proofs the conception of the author that the velocity of light and of fundamental movements within atoms or elemental particles orients on predominating gravitational fields. All experiments, which are regularly mentioned as a proof of the correctness of the theories of relativity, can also be explained by the this conception of the author, with a very simple mathematics, as shown in my former articles in *Physics Essays*.[2,6,7] But the theories of relativistic physics are meanwhile dogmatic theories which are not allowed to be disputed. The conception of the author is even able to explain phenomena which cannot be explained by the "theory of general relativity" of Albert Einstein, for example, the anomalous secular increase of the Moon orbit eccentricity.[4]

The experiment of Hafele and Keating[12] also showed that atomic clocks go faster at a certain altitude than on the surface of Earth. The existence of this so-called relativistic gravitational effect was taken as an argument for the correctness of Einstein's theory of general relativity, which postulates that the flow of time is influenced by gravitational force, what is true, but in another context, for example, pointed out above. But the so-called relativistic gravitational effect can simply be explained by nonrelativistic considerations: Electromagnetic radiation should lose energy if the gravitational attraction on the electromagnetic radiation increases. Because the energy is proportional to the frequency of electromagnetic radiation, we have to postulate that the frequency of electromagnetic radiation must decrease if the electromagnetic radiation loses energy by interacting with a stronger gravitational field. Because of that, for the oscillation of atoms within an atomic clock, we also have to postulate that the frequency of oscillation of atoms in atomic clocks decreases if the gravitational attraction on the atoms increases, because of the loss of energy by a stronger gravitational attraction.

XIX. SPECULATIVE CONSIDERATIONS ABOUT LARGER PARTICLES THAN ELECTRONS OR POSITRONS

There exist positive or negative particles, which obviously behave like larger positrons or electrons, for example, the positive or negative charged myon. The myons should therefore consist of positrons or electrons ending on both sides by a strong binding structure to which are attached weakly bound further b-particles, whereas positive and negative b-particles must alternate, as they obviously neutralize each other. The electron should consist of b-particles$^+$ causing an electromagnetic field of free bs-particles$^-$ and the positron should consist of b-particles$^-$ causing an electromagnetic field of free bs-particles$^+$. Former free bs-particles$^-$ and free bs-particles$^+$ should be able to bind at the end of the electron, respectively, positron, by the weak binding mechanism. By the alternately binding of former free bs-particles$^+$ and bs-particles$^-$, we expect complexer instable elemental particles, which have a larger mass than the electron or positron. But as they have not a closed structure, for example, a circle, they should appear with similar spatial characteristics like an electron or a positron, which could be expected to be the so-called negative or positive charged myon or tau. We can imagine the negative or positive myon and the negative or positive tau to be elemental particles consisting of an electron, respectively, a positron, on whose both sides of the electron or positron, there is a structure consisting of alternately disposed b-particles$^-$ and b-particles$^+$. As these neutral structures do not build up closed structures, they behave on both sides of the electron or the positron like flags on a flagstaff. If one tries to examine the structure of the myon or the tau by bombarding the myon or the tau with elemental particles, the resistance, which can be registered is always only the condensed structure of the electron, respectively, the positron, which represents in this example the flagstaff, whereas the flags, which represent the neutral material structures on both sides of the electrons or positrons should be always able to swerve the bombardment of the elemental particles. The moment the neutral structures attached to an electron or a positron consisting of an alternating sequence of b-particles$^-$ and b-particles$^+$ are completed to a closed (probably circular) structure, the particles should get new qualities, as now the closed structures of the new particles can by their long binding structures contact other particles with closed neutral structures with their long binding structures, so that between the b-particles$^-$ of the particle and the b-particles$^-$ of another particle and also between the b-particles$^+$ of the particle and the b-particles$^+$ of another particle there can be realized the strong binding force, which is now registered as the strong nuclear force. The new particles should have a mass near the myons, so that we can expect the pions to be these new particles, which indeed can interact with other particles with the strong nuclear force.

XX. LEARNING FROM THE COMPOSITION OF NUCLEI OF ATOMS

Larger atoms than the hydrogen atom have in there center positive charged protons and neutral charged neutrons. Each atom of a specific element has a constant and unique number of protons. Therefore, the element and its physical properties are defined by the number of protons. The atomic number of an element represents the total number of protons that the element has, but there are realized different amounts of neutrons of the same element, which are named isotopes. The more protons an element has, the more neutrons are within the nucleus of the element. The protons would reject each other by the electromagnetic force, but the neutrons prevent them from doing so by the strong nuclear force, between protons and neutrons which glues the protons and neutrons together. As also the smaller pions are able to use the strong binding force, respectively, the strong nuclear force, it would be plausible that also pions use the stabilizing concept, like that between protons and neutrons of a nucleus of an element.

XXI. ARE PIONS THE PARTICLES BUILDING UP PROTONS, ANTIPROTONS, AND NEUTRONS?

Since the sixties of the last century, the so-called quark-model was used to explain the different particles. But quarks have never been detected, despite an enormous effort to find them. But when a proton and antiproton annihilate, there always result pions. Why should it be forbidden to think that pions might build up protons, antiprotons, and neutrons. As the pions are able to use the strong binding force, respectively, the strong nuclear force, it would be senseless, if the strong force of the pions was not used in nature to realize larger particles. If we want to develop a model of pions building up protons, antiprotons and neutrons, we have to consider that a proton and an antiproton are charged particles, which must consist of an odd number of charged pions. A nucleus built up by pions must be glued together stronger than only by the so-called strong nuclear force, respectively, the introduced strong binding force. If we do not want to introduce a fifth basic physical force, the strongest thinkable force would be a combination of all fundamental binding forces, whereas the gravitational force we can neglect in this context.

A set of pions building up a nucleus would be most stabile, if the pions could use the strong binding force, the electromagnetic force, and the weak binding force together. As already explained above, electrons and positrons should be able to function as some kind of condensation cores, building up larger particles such as myons, taus, and pions. A positive pion can be expected to be a particle built up of a positron (consisting of b-particles$^-$ emitting bs-particles$^+$) and condensed b-particles on both sides, whereas b-particles$^+$ and b-particles$^-$ alternate. A negative pion can be expected to be a particle built up of an electron (consisting of b-particles$^+$ emitting bs-particles$^-$) and condensed b-particles on both sides, whereas b-particles$^+$ and b-particles$^-$ alternate. A neutral pion usually decays into two photons, but the second largest π^0 decay mode is into a photon and an electron-positron pair. So it is plausible to go from the imagination that from the neutral part of a charged pion, a certain number of the b-particles were changed into a positron, respectively, electron, whereas some of the b-particles of the neutral part got lost. Of course, there does not exist a direct proof that a neutral pion contains a negative and a positive charged structure comparable with an electron and a positron, but it seems to me much more plausible than the imagination of the today's quark model, according to which a neutral pion contains a combination of up, down, antiup, and antidown quark, and therefore, a combination of negative charges of $-2/3$ and $-1/3$ and positive charges of $+2/3$ and $+1/3$. The two kinds of neutral pions should be able to change in one another. As the neutral pions behave completely the same, if they are isolated, their difference can only be observed indirectly at larger particles, which are composed of pions. That there should exist two kinds of neutral pions can be observed at the behavior of neutral kaons. There exist two kinds of neutral kaons, which can be transformed in one another

$$K^0 \rightarrow \pi^+\pi^- \rightarrow \bar{K}^0. \tag{52}$$

Each of the neutral kaons has a 50% probability to decay in tow different kaons

$$\begin{aligned} &K^0 \rightarrow \mathrm{K}^0_\mathrm{S} : \textit{decay time } 0.892 \times 10^{-10}\ \mathrm{s}, \\ &K^0 \rightarrow \mathrm{K}^0_\mathrm{L} : \textit{decay time } 0.518 \times 10^{-7}\ \mathrm{s}, \\ &\bar{K}^0 \rightarrow \mathrm{K}^0_\mathrm{S} : \textit{decay time } 0.892 \times 10^{-10}\ \mathrm{s}, \\ &\bar{K}^0 \rightarrow \mathrm{K}^0_\mathrm{L} : \textit{decay time } 0.518 \times 10^{-7}\ \mathrm{s}. \end{aligned} \tag{53}$$

Each neutral kaon can be considered to consist of a positive and a negative pion, as well as a neutral pion, whereas latter should be able to be transformed from one kind of neutral pion into the other kind of neutral pion. There also exist neutral kaons, which consist of three neutral pions, whereas the different kinds of neutral pions can also change into one another. A neutral kaon can either decay after a change of a neutral pion into another neutral pion (which takes some time $= \mathrm{K}^0_\mathrm{L}$), so that there result three pions after the decay of the kaon, or a neutral kaon can decay without the change of a neutral pion into another neutral pion, so that it gets destroyed immediately into bs-particles (which takes less time $= \mathrm{K}^0_\mathrm{S}$), so that there result only two pions after the decay of the kaon. But although the change of a neutral pion happens, which takes more time, this change can be unsuccessful, so that the K^0_L decay can to a small amount (0.2%) also decay into only two pions. The behavior of the kaons is explained by today's physics by the existence of a "quark," which is called "strange" or "s" in short.

The simplest model of a proton built up by pions needs seven pions. If we add the masses of the seven pions, we get on the whole a mass of 958.63 MeV. Considering that some of the b-particles of the pions in the center of the proton, respectively, antiproton, are hidden behind other b-particles of the outer pions, which reduces the interaction between the b-particles of the pions and the free bs-particles of space causing a somewhat lower gravitational effect, this value corresponds very well with the mass of a proton (938.27 MeV). Let us examine a proton consisting of two positive charged pions and one negative charged pion, stabilized on the whole by four neutral pions. Pions with the same sequence of b-particles of the neutral part of the pions can bind with the strong binding force toward each other, pions with a different sequence of the b-particles of the neutral part of the pions can bind only with the weak binding force toward each other or with the electromagnetic force, if the pions are charged pions. From the binding possibilities, there results a proton and an antiproton. The proton consists of two positive charged pions and one negative charged pion stabilized by two neutral pions going out from positive charged pions, so that the two positive charged pions can interact with the four neutral pions by the strong nuclear force, the negative charged pion can interact with the two positive charged pions by the electromagnetic force and with all other pions also by the weak nuclear force. The antiproton consists of two negative charged pions and one positive charged pion stabilized by four neutral pions going out from negative charged pions, so that the two negative charged pions can interact with the four neutral pions by the strong nuclear force, the positive charged pion can interact with the two negative charged pions by the electromagnetic force and with all other pions also by the weak nuclear force, see Fig. 9. As in the case of a proton, pions are stabilized by all four fundamental forces and the negative charged pion is also embedded within the proton, it should be very stable. As the mass of a neutron is given by 939.57 MeV, the neutron cannot be composed of an additional charged pion, and a neutron can also not be composed of three neutral pions, two positive charged, and two negative charged pions, because then the neutron would be able to decay in a proton by emitting a negative charged particle larger than an electron or in an antiproton by emitting a positive charged particle larger than a positron, what is not observed. A neutron should therefore be expected to be a proton, which has captured an electron. If we accepted that a proton and an antiproton are built up by pions, it would be understandable why in our universe there are only realized elements consisting of matter, but not of antimatter, which is explained in Sec. XXII.

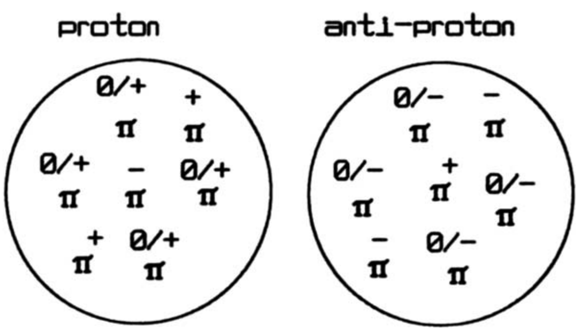

FIG. 9. Possible composition of the proton and the antiproton. There exist two kinds of neutral pions; the one kind went out from a positive charged pion and the other kind from a negative charged pion.

According to that, the nuclei should have a triple structure (positive, negative and neutral pions) in their center, which was also confirmed by experiments in which electrons were scattered off nuclei. From the experiments, it could be also implied that the scattering happened from some charged particle within the nucleus. The same kind of evidence in the high energy scattering of electrons off protons can be also interpreted that there is a smaller charged particle inside which remains intact even as the proton breaks apart from other nuclei. The standard model interprets this experimental results a confirmation of the so-called quark-model. According to the quark-model, there exist six types of quarks, "up, down, strange, charm, bottom, and top." It is postulated that quarks have fractional electric charge values, either 1/3 or 2/3 times the elementary charge, so that from the combination of the fractional electric charges there can result either one negative or one positive charge. But fractional electric charges, as well as quarks, could not be found in reality, which led to the concept of confinement of the quarks within the particles. Always when the experiments did not suit the favorite quantum model, a new *ad hoc* theory was postulated. With these considerations, I want to finish my speculations about particles larger than electrons or positrons.

XXII. SPECULATIONS ABOUT THE "BIG BANG THEORY"

Quasars are very intense sources of radio waves which look in visible-light telescopes like a stellar object, therefore, these objects are called "quasi-stellar radio sources," or "quasars" in short. It was found that these sources are very bright centers of distant galaxies, where some sort of energetic action is occurring, most probably due to the presence of a supermassive black hole at the center of that galaxy (supermassive = made up from a mass of about a billion solar masses), whereas the infall of matter into the supermassive black hole causes a very hot region releasing huge energies, powering the quasar producing electromagnetic radiation. The region of intense visible emission is quite small compared with the rest of the galaxy that it is imbedded in. Astrophysicists expect that the supermassive black holes in the centers of quasars are feed with dense gas around the black hole. As quasars are found in the most distant regions of the universe, we see them as they must have looked shortly after the big bang. But we would expect in the early stadiums of the universe matter to be scattered in space and we would expect that by gravitation material accumulations get more and more dense with time. But examinations of distant quarsars found out that these galaxies are massive galaxies with a high ratio of metallic elements.[13] How is it possible that very large dense material accumulations with a high ratio of metallic elements are found in structures in the very early history of the universe shortly after the big bang? The answer is easy: The quasars must be young structures and old structures at the same time. But this means that there must have happened at least two big bangs in the past. In this case, the very distant quasars would be old structures with respect to a former big bang, what means that the matter of the quasars was built up before the latest big bang, which caused the matter of the galaxies closer to us and the matter of our galaxy, so that with respect to us the quasars consist of very early material structures. If we go from the assumption, as today's astrophysicists do, that the universe expanded from one big bang in the way that we now observe, then there would have been no time for such an expansion, as we observe it. In 1979, Alan Guth proposed that very early in the history of the universe, when it was only 10^{-37} s old, the universe suddenly began to expand at an exponential rate. In other words, as time passed by the universe grew even larger even faster as its rate of expansion increased. According to Alan Guth, the universe very rapidly exploded in size by 25 orders of magnitude when suddenly, just 10^{-34} s later, this period of "inflation" (as Guth called it) came to a halt. If we go from the imagination that before the latest big bang, there was at least another big bang, the additional theory of inflation is not necessary to explain the expansion rate, which must now referred not only to one big bang. Also the inflation theory is not needed to explain the flatness of the space of the universe, as we have abandoned the imaginations of relativistic physics, as pointed out in my former articles in *Physics Essays*, so that we have to go from the assumption that we do not live in a four-dimensional space-time, but in a three-dimensional space, which is by definition a flat space.

If there must have happened at least two big bangs, we have to go from the imagination that there is a cyclic emerging of big bangs. As the far quasars **and** the nearer galaxies still move away from each other the reason for cyclic big bangs cannot be a result of gravitation slowing down till the movement of the quasars and the galaxies will stop moving away from each other and turning back the movement, so that they might move toward each other until all matter is rejoined in a new singularity from which there might emerge a new universe in another big bang. A cyclic emerging of big bangs for other reasons can only result, if the characteristics of the contents of the universe change with the time in the same way again and again, so that there can be caused new big bangs. But this would mean that the universe must content all that is needed to create material structures. On the other hand, this would also mean that the universe must have a border, because only then there could result again and again the same conditions, which cause a new big bang.

If we consider that the general theory of relativity does not correspond with reality and there does not exist a four-dimensional space-time, space did not come into being with the big bang, as suggested by the cosmological interpretation of the general theory of relativity. That the universe should have some kind of boundary might sound unimaginable, but an infinite universe is also difficult to imagine. As mentioned above, the universe shall be filled up with some kind of basic material structure, which causes all material appearances and which I called bs-particle. The bs-particles move through the confined three-dimensional space of the universe usually not interacting with each other. But if the density of the free bs-particles within the vacuum is increasing more and more, so that the bs-particles are pressed more and more together, the density will reach a certain critical level, by which the bs-particles begin to interact with each other, so that material phenomena come into being, beginning with high energetic radiation causing a big bang and shortly later, after cooling down, resulting in material structures, like elemental particles, for example, electrons or positrons and later protons and neutrons.

That the proton and the antiproton came into being in different amounts, so that the proton successfully survived the annihilation processes between matter and antimatter is easily understandable, if protons and antiprotons were built up by the two different neutral pions. As described above, the protons should consist of two positive charged pions and one negative charged pion stabilized by four neutral pions going out from positive charged pions, so that the two positive charged pions can interact with the four neutral pions by the strong nuclear force, the negative charged pion can interact with the two positive charged pions by the electromagnetic force and with all other pions also by the weak nuclear force. The antiproton consists of two negative charged pions and one positive charged pion stabilized by four neutral pions going out from negative charged pions, so that the two negative charged pions can interact with the four neutral pions by the strong nuclear force, the positive charged pion can interact with the two negative charged pions by the electromagnetic force and with all other pions also by the weak nuclear force. If we go from the consideration that by coincidence more neutral pions survived, going out from positive charged pions, than neutral pions, going out from negative pions, it is understandable, why more protons survived at last. Otherwise, the proton and the antiproton should have been arised in equal parts, see Fig. 9.

By the arising of material phenomena, and in particular, stable particles, a lot of the bs-particles condense to b-particles building up matter, so that the density of free bs-particles moving by the velocity of c through the universe gets lower, until the interacting of the free bs-particles stops again, whereas the universe contains now a much lower amount of free bs-particles. With time with the help of gravitation, there arise galaxies with stars and planets and the galaxies get more and more dense as well as the centers of the galaxies, in which there result black holes getting larger and larger by the time swallowing more and more matter of the galaxies. The older the galaxies, the compacter they should be and the more mass should be concentrated in the central area and the central black hole of the galaxy, what would be the case in the quasars far away from us. As we should expect that the material structures, as protons, neutrons cannot be indefinite stably under more and more increasing gravitational pressure within black holes, we have to assume that under the gravitational pressure in black holes, matter gets squashed and destructed, so that the bs-particles are set free again, what means that the black holes "vaporize" by the time. Hereby, the density of the free bs-particles moving within the borders of the universe increases again, until the critical density level is reached again, which causes an interaction of the bs-particles resulting in another big bang, and so on. The first increase of the density of the bs-particles up to the critical density level resulting in the first big bang of course cannot be understood without referring to something outside the system of the universe, what will surely for ever lie beyond our horizon of possible experience. When discussing a cyclic big bang, some physicists tried to ridicule this imagination, but some others thought it a possible idea, like Roger Penrose.

XXIII. CONCLUSIONS

According to the introduced binary quantum theory (BQT), there exist only two kinds of basic particles, positive and negative basic particles. To distinguish between bound basic particles, which build up (elemental) particles, and free basic particles, which fill up the vacuum, I named the bound basic particles b-particles^{+} and b-particles^{-} and the free basic particles bs-particles^{+} and b-particles^{-} (basic space particles). The bs-particles^{+} and the b-particles^{+} carry a long positive structure and a short negative structure, while the b-particles^{-} and the b-particles^{-} carry a long negative structure and a short positive structure, see Fig. 1. Despite the obviously attracting and disattracting electromagnetic force, there exist only attracting forces between structures of the same algebraic sign, which is in detail explained in the article. By simple considerations, the four fundamental forces of physics could be explained as different effects of the interaction between the two different basic particles that exist. So-called special and general relativistic phenomena could be also explained in a simple way. By the BQT also the fine-structure constant alpha and the Planck constant could be derived by simple considerations from experimental results. If we used for the two kinds of basic particles not the traditional terms positive and negative, but for example, 1 and 0, the model resembles a three-dimensional self-organizing computer program, which starts its self-installation with the big bang and ends with the self-deinstallation within black holes. I admit that this sounds quite crazy. The dogma of relativistic physics that the velocity c shall be invariant against any motion led to an impasse in physical research. It is useless and should be given up by the community of the physicists.

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