B. Feng's Theory (Part Ⅱ): The Origin of Charge and the Unified Field Theory-Going on Kaluza-Klein's

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Abstract

Going on Kaluza-Klein's work, a one motion three properties model is proposed. The motion is the energetic vacuum moved in spherical four-dimensional space-time. Spin, mass and electric charge the three essential properties are unified in the one motion; gravitation and electromagnetic force are then unified in the literature. The gravity constant can be expressed by instant dipole moment and other parameters of matter and is variable with temperature and non-atomic forms of matter therein and there is no interaction arisen from mass feature. Charge is the original spin of vacuum along the time axis. Every elementary matter particles must be charged; the neutron is a composite particle thereby.

Keywords: Kaluza-Klein theory; Origin of charge; String theory; Unified force

Introduction

Unified field theory is the top problem is physics. Scientists have studied it for centuries. After the publication of the successful general relativity in 1916, great Einstein had devoted himself to the study of unified field theory until his end for nearly 40 years, unfortunately his effort failed ultimately. Feynman realized the failure was that Einstein had gone too far to the seeking of perfect mathematical function, neglecting the real physical views; and Heisenberg considered that was because of Einstein refused to accept the quantum theory in nature and the author agree with them all. An important thing is that, one can find a remarkable fact in the field that in early 1921, by the suggestion of Einstein, Kaluza (a German mathematician and physicist) proposed his idea [1] in *Math Phys*. Along Kaluza's work, Klein (1926) and representative Figure Thiry (1948) contributed quantum interpretation [2] and full Kaluza field equations [3] in the so-called Kaluza theory (later Kaluza-Klein theory) respectively, also it is worth mentioning that Klein even published his paper in the famous journal *Nature* [2].

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In physics, Kaluza-Klein theory is just the unified field theory that is right the aim of this paper. It concerned the gravitation and electromagnetism concepts which built around the idea of Fifth Dimension extended from the usual four of space-time. It is considered to be an important precursor to present string or superstring theory.

In my view, the main thoughts and conclusions in Kaluza-Klein theory are right; it nearly touched the final truth with the God. However, it hasn't be recognized by Einstein and even the mainstream of physics circles. Whether it really told a wrong thing? As so far in the way of unification till now, we haven't obtained any satisfied solutions worldwide. We have to take and examine it again; right and wrong are a serious problem in science; it must be clarified first and then continued to forward.

Experimental

What the Kaluza-Klein theory faced

Kaluza-Klein theory is developed lonely, as a classical unified field theory it had been abandoned and neglected by 1950's even after the important contributions by Thiry in 1948. The reasons may because of following:

First, it was born too early to its era; the scientific community can't catch up its idea, or to say that it is too abstract to understand in those days. Further that, as a matter of fact, the similar fifth dimension was first introduced by Gunnar Nordström in early 1914, of course it hadn't aroused any attention and elapsed quietly.

Second, Einstein's attitude towards it is representative and authoritative. Without any new evidence, no one would like to challenge Einstein's intelligence in the extremely abstract field.

Third, its hypothesis described the origin of charge, but not concerned the mass. As habit, it is difficulty for public to believe. Fourth, according their theory, Klein calculated electron's mass resulted as much as MeV. That is far more absurd.

Fifth, in those decades, the impression that, particles infinitely cutting apart was deep-seated in mind. Hence, in early 1960s, the representative figures: Murray Gell-Mann, Peter M. Higgs, Steven Weinberg, Sheldon Glashow and Abdus Salam et al. scientists naturally established the Standard Model of particle physics and there the "quarks" concept become the mainstream of the world view even up to present day. Under the guidance of the model, paid expensive cost and done their best, experimental physicists discovered all the predicted particles eventually (beside the quarks however), especially the W and Z bosons and the latest discovered (2012) Higgs boson. As much as 18 Nobel Prizes in physics have awarded to the field. However, these halos of honor have influenced and blocked the development of unified field theory. A gratifying thing is that many complaints have arisen from all of world. To speak frankly, indeed the standard model is nothing. There the predicted and proofed unknown particles do not naturally exist in nature, or to say that it just told us those useless and instant particles can be synthetized artificially; no more significant meanings it has. As a basic theory, standard model can't tell us the nature of mass, charge and spin, can't explain gravity and the relation between baryons and leptons, even it can't calculate the mass unless each mass concerned parameter was prior inputted. A serious thing is that, the important neutrinos were predicted to be massless, however as a matter of fact they are confirmed to have a slightly rest mass by oscillating experiments.

Sixth, the String Theory was founded soon after the standard model. It is a theory concerned the unified field theory. Its growth also obscured the sunlight of Kaluza-Klein.

How to regard the String theory

String theory was established during 1969-1990 by Nambu [4], Nielsen [5], Leonard Susskind, Michael B. Green, John H. Schwarz, Joël Scherk and Edward Witten et al. scientists. Inherited the framework like "quark and gluon" of standard model and borrowed Kaluza-Klein's idea, it proposed a model of "string". Let the string to vibrate, then different vibration patterns of string expressed or carried a particle one certain property such as the mass, electric charge, weak charge, strong charge and gravitation. In string theory no adjustable parameters is needed. It eliminates all the defects of standard model with perfect symmetries mathematically. Its disadvantage is the difficulties in solving even approximate solutions. Its defect is the hold of the frame of standard model. That caused it deviate the correct azimuth. Besides, its high dimension of eleven is amazing. God knows whether the high extra dimensions were pure mathematically or real physically. By the way, as an abandoned theory, Kaluza-Klein was rarely mentioned by string theory authors.

Einstein's unaware contribution

The famous mass-energy relation of Einstein is well known all of the world. It just this equation and afterward experiments especially positive substance and antimatter quenching that revealed the nature of mass [6]. This recognition is important and will become the footstone of unified field theory. Almost nobody even Einstein himself recognized or confirmed this meaning in those days.

Guiding ideology

Drawn lessons from previous experience, we must deny standard model thoroughly except the symmetry method where used; admit the relatively limited symmetries view [7] and the real wave mechanism of quantum theories in micro physical world; use the present solutions of nature itself to solve the unknown natural problems, do not aspire the perfect mathematical expressions and the prior *ab* initial calculations mathematically; used the proofed four-dimensional space-time point of view [8]; accept Kaluza-Klein's idea and improve and perfect the theory; reveal the origin of charge: the key point towards the unified field theory; overall consider mass, charge and spin the essential three properties.

Modeling-one motion three properties

According to Einstein, Kaluza [1], Klein [2], B. Feng [9-13] and my previous contributions [6,8] and above analysis and guiding ideology, we come to conclude the followed hypothesis.

Hypothesis

The space of universe is spherical (surface) four-dimensional space-time. Everything in the universe is united into a vacuum (or to say, new ether, which possess every properties of vacuum [14]). The essence of the existence of nature is the motion of energetic waves of vacuum and the motion is spread symmetrically in spherical four-dimensional space-time. The essence of beingness is the stabilities and the quantized values are the necessity solutions for a stable wave function under certain boundary conditions. The vacuum's straight propagating in three-dimensional space (keep still in time axis) is as light; its un-

continuity is presented as particle. The vacuum's closed circle propagating in four-dimensional space (Vacuum in three-dimensional space rotating along time axis) forms the matter particles. Just this one motion simultaneously exhibit spin, mass and electric charge the so three essential properties of a particle and these characteristic particles constituted the atoms and molecules and the worldwide everything. The structural hierarchy relation is simply showed in FIG. 1.
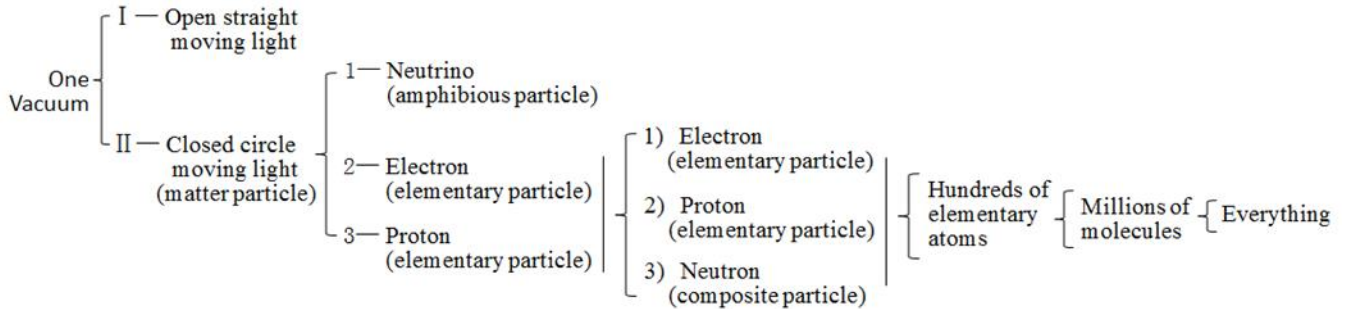

FIG. 1. **The structural hierarchy relation of matter world.**

According to above hypothesis, we come to following reasonings:

Reasoning 1

Spin is the first intrinsic attribute all of the three essential properties of elementary matter particles. Every elementary matter particles must have there spin. In other words, the elementary matter particles can only exist in case of spin state because of its confined movement among a small size of space [6]; no spin, nothing of everything. Spin is the motion in four-dimensional space along time axis, so spin has two opposite directions. If an elementary particle has no spin, it must be the straight traveled wave of light.

It must be mentioned that, the concept "spin" used here is played up to a habit use. Actually indeed, it is the vacuum that rotating along time axis (*ict*). The use of word spin is not clean cut, because the spin means that there is an object exists before it rotating, however it is not the real case.

From our three dimensional world, spin is an abstract concept. It must be emphasized that the spin here is not the spin where usually describe electron in atoms [15], they were easily confused by common people. Another thing is that the spin here will not produce any magnetism.

Reasoning 2

"Mass is the confined movement of energy". Further statement, mass (means rest mass here and following) is the energy of spin or one form expression of energy for elementary matter particles. Every elementary matter particles must have their rest mass. Mass is the symbol of particle. Particle essence is the spinning wave and discrete wave is presented as particles. Elementary matter particles are all accessible however inseparable physically. In essence, there is no interaction arisen from mass feature. Mass is the property of 4-D projection on the three-dimensions.

From the point of view, B. Feng and the author contribute a scheme for calculate the mass spectrum of elementary particles by symmetry method of the only suitable 16 regular polytopes in 4-D [8]. The conclusive mass (*m*) calculation formula is as follows:

$$m = \frac{hc}{2\pi R_i'} = 2^{i-1} e^{\varphi' - \frac{\pi}{2}} \qquad (1)$$

$$\begin{cases} \varphi' = 2\pi + \frac{\pi}{2} + \frac{4\pi}{16} J_1 \zeta & \text{(for "1" layer, } i = 1) \\ \varphi' = 4\pi + \frac{\pi}{2} + \frac{4\pi}{16} J_1 + \frac{4\pi}{16 \times 16} J_2 \zeta & \text{(for "2" layer, } i = 2) \end{cases}$$

where, R_i' is the R_i 4-D projection in 3-D, R_i the radius of manifolds of particle, φ' the corrective angle of a particle to imaginary time axis and $\zeta = 0.970624$, $J_i \in \{1, 2, 6, 7, 9, 10, 14, 15\}$.

As to electron and proton, the structure symbol is expressed as *B* (9) and *B* (9, 7); their calculating mass is 0.511 MeV and 940.2 MeV correspondingly and they are well matched to experiments.

What is interesting is that, the important neutron particle is not concluded in the calculated mass spectrum by above method.

Reasoning 3

Charge (means electric charge here and following) is an effect of spin. As every elementary matter particles have spin, also they must have their charge accordingly. And the sign of charge depend upon the direction of spin. Charge has only absolute one value, because of the constant angular momentum of spin. Like mass property, the charge is also indivisible physically. Charge can't exist to be independent of mass and spin; also charge can't be a structure of matter especially. It is important that, there must be interaction between charges.

As a medium, vacuum is like fluid water. An influence is inevitably exists when a spin particle existing to its fluid medium surroundings and the influence or effect is like that of hydrodynamics. That is to say, when apart spin particles exist in vacuum, the surrounding vacuum medium will change its state and makes heterocharged particles attract and homocharged repel.

According to formula (1),

$$mR' = \frac{hc}{2\pi} \;,\; mvR' = \frac{hcv}{2\pi} \;,\; p = \frac{h}{2\pi} cv \;, \text{ as } v = c \text{ here, we have,}$$

$$p = \frac{h}{2\pi} c^2 = \text{Contant}$$

Where, *p* stands for the angular momentum, *v* the velocity of spin vacuum.

It is clear that, whether it is electron or proton, they harmoniously have the same angular momentum and the same angular momentum is corresponding to same absolute value of charge.

B. Feng has derived the value and formula of charge in his paper [11]. The result is as,

$$e = \sqrt{\frac{3}{64\pi}\frac{h}{\mu_0 c}} = \sqrt{\frac{3}{64\pi}\frac{6.6260755\times10^{-34}}{4\pi\times10^{-7}\times2.99792458\times10^{8}}} = 1.61998\times10^{-19} \text{ C} \qquad (2)$$

Reasoning 4

Neutron is not an elementary matter particle, but a composite one. Because, every elementary matter particles must have their nonzero charge. As well, this point of conclusion is coinciding with the mass spectrum which declared above.

Gravitation: The attraction of static electricity

According to above model, the force only occurs as a result of charge. As to neutral particles, the between force must come from electric dipole. For nonpolar molecule or atom, the between force is arisen from its instant dipole (like the Van der Waals' force described in chemistry). Further, to micro bodies mainly the massive celestial planets, the origin of their attractive gravitation is also the instant dipole-dipole interaction of as many as infinite atoms, but not the polar chemical bonds or polar molecules in them, as these fixed polarities are counteracted inside and play no influence to its outside body.
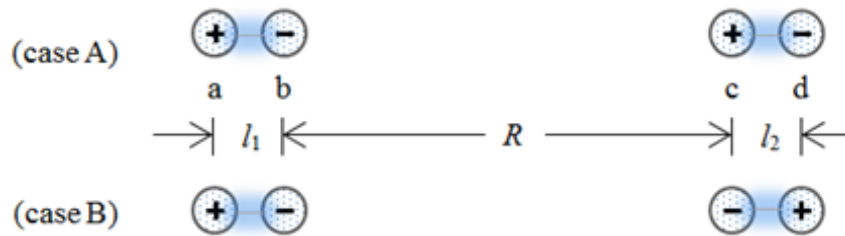

FIG. 2. **Relative position diagram of two dipole atoms.**

The instant dipole of two atoms can be expressed equivalently as point dipoles [16] showed in FIG. 2. The dipole-dipole interactions needs only consider two opposite case, as shown in FIG. 2A and 2B. And the two opposite case cause the same but opposite forces, however they can't be canceled because of their different opportunities; the lowest energy principle makes the attractive case having more opportunities than the repulsive one. So, we only need to consider the effective dipole attractive interaction case.

The mathematical relation of dipole-dipole interaction (in case "A" of FIG. 2) and the gravitation of two atoms can be derived as follows:

$$f_{bc} = -\frac{1}{4\pi\varepsilon_r}\frac{\delta_1\delta_2}{R^2}, \; f_{ad} = -\frac{1}{4\pi\varepsilon_r}\frac{\delta_1\delta_2}{k(R+l_1+l_2)^2}, \; f_{ac} = \frac{1}{4\pi\varepsilon_r}\frac{\delta_1\delta_2}{k(R+l_1)^2}, \; f_{bd} = \frac{1}{4\pi\varepsilon_r}\frac{\delta_1\delta_2}{k(R+l_2)^2}$$

$$f_{bc} = -\frac{1}{4\pi\varepsilon_r}\frac{1}{l_1 l_2}\frac{\mu_1\mu_2}{R^2}, \; f_{ad} = -\frac{1}{4\pi\varepsilon_r}\frac{1}{k(1+\frac{l_1}{R}+\frac{l_2}{R})^2 l_1 l_2}\frac{\mu_1\mu_2}{R^2},$$

$$f_{ac} = \frac{1}{4\pi\varepsilon_r}\frac{1}{k(1+\frac{l_1}{R})^2 l_1 l_2}\frac{\mu_1\mu_2}{R^2}, \; f_{bd} = \frac{1}{4\pi\varepsilon_r}\frac{1}{k(1+\frac{l_2}{R})^2 l_1 l_2}\frac{\mu_1\mu_2}{R^2}$$

$f_\Sigma = f_{bc} + f_{ad} + f_{ac} + f_{bd}$, as $l_1 \approx l_2 = l$, then,

$$f_\Sigma = -\frac{1}{4\pi\varepsilon_r}\left(\frac{1}{l^2} + \frac{1}{k(1+\frac{2l}{R})^2 l^2} - \frac{2}{k(1+\frac{l}{R})^2 l^2}\right)\frac{\mu_1\mu_2}{R^2} \qquad (3)$$

Where, f_{bc} is the force between charged points "b" and "c" and so the same meanings of f_{ad}, f_{ac} and f_{bd} correspondingly; δ_i is standing for the dipole charge and μ_i the effective dipole moment, l_i the dipole spacing and $\mu_i = \delta_i \times l_i$, where the subscript "i" correspond to atom "1" and "2"; R is expressed the distance between two atoms and ε_r the dielectric constant, ε_0 the dielectric constant in vacuum, k the correction factor of ε_r. It must be mentioned that the introduction of correction factor, k, is the key point of the force description in formula (3). Because the interactions between points "a-c", "b-d" and "a-d" (except "b-c") have additional one or two atomic medium; the dielectric constant is then changed as $\varepsilon_r k$, otherwise there would be no interactions at all when l/R tend to zero.

For planets, the total dipole charge is the sum of their atom's dipole charge and can be expressed as $\tilde{\mu}_i N_i /l$. So, the force (F) between planets is,

$$F = -\frac{1}{4\pi\varepsilon_r}\left(\frac{1}{l^2} + \frac{1}{k(1+\frac{2l}{R})^2 l^2} - \frac{2}{k(1+\frac{l}{R})^2 l^2}\right)\frac{\tilde{\mu}_1 N_1 \tilde{\mu}_2 N_2}{R^2}$$

Where, $N_1 = \frac{m_1}{\tilde{M}_1}N_A$, $N_2 = \frac{m_2}{\tilde{M}_2}N_A$ and as $\tilde{M}_1 \approx \tilde{M}_2 = \tilde{M}$, then,

$$F = -\frac{\tilde{\mu}^2 N_A^2}{4\pi\varepsilon_r \tilde{M}^2}\left(\frac{1}{l^2} + \frac{1}{k(1+\frac{2l}{R})^2 l^2} - \frac{2}{k(1+\frac{l}{R})^2 l^2}\right)\frac{m_1 m_2}{R^2} = -G\frac{m_1 m_2}{R^2}$$

As $l/R \approx 0$, then,

$$F = -\frac{\tilde{\mu}^2 N_A^2}{4\pi\varepsilon_r \tilde{M}^2 l^2}\left(1 + \frac{1}{k} - \frac{2}{k}\right)\frac{m_1 m_2}{R^2} = -G\frac{m_1 m_2}{R^2}$$

Let $k = 1 + \tau$, it has the form as,

$$F = -\frac{\tilde{\mu}^2 N_A^2}{4\pi\varepsilon_r \tilde{M}^2 l^2}\left(\frac{\tau}{1+\tau}\right)\frac{m_1 m_2}{R^2} = -G\frac{m_1 m_2}{R^2} \qquad (4)$$

So we come to equation,

$$G = \frac{\tilde{\mu}^2 N_A^2}{4\pi\varepsilon_r \tilde{M}^2 l^2}\left(\frac{\tau}{1+\tau}\right) \qquad (5)$$

Where, $\tilde{\mu}$ is the average effective dipole moment, $\tau = k - 1$; N_A is standing for the Avogadro's number, and $\tilde{M}$ the average atomic weight, m_i the mass of planet, G the gravity constant. And $N_A = 6.022 \times 10^{23}$ mol^{-1} , $\varepsilon_r \approx \varepsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2} , $G = 6.670 \times 10^{-11}$ N m^2 kg^{-2} .

Take the earth as the representative distribution of atoms, the weighted average atom is "Na", so we have, $\tilde{M} = 23$ kg/mol , and

$l = 2 \times 1.85 \times 10^{-10} \, \text{m}$.

At the condition that the $\tilde{\mu}$ and τ spontaneously possess the same precision of significant figure, we can solve equation (5) and obtain the appropriate two values of,

$\tilde{\mu} = 1.06 \times 10^{-35} \, \text{C m}$, and $\tau = 1.34 \times 10^{-14}$.

Results and Discussion

Equation (5) showed us that the gravity constant is not a fixed constant in universe. Its value depends on dielectric constant (ε_r), average effective dipole moment ($\tilde{\mu}$) and average atomic weight ($\tilde{M}$). That means it will to be temperature dependent; a hot fixed star would plays less gravitation to its surrounding planets owing to its bigger dielectric constant, whenever it cold down, the gravitation would conversely rise. The gravity constant will also depend on the planet's atomic component and the forms of matter. As to neutron star, the gravity constant would be much smaller than normal, because of neutron has more less instant dipole moment compared with atom. Especially that, to Black Holes, the instant dipole moment would be even small; it means that the mass of black holes and other heavy stars may be undervalued by means of normal gravity constant.

In fields of astrophysics, the present concept of dark matter is like thunder piercing the ear. Many people proposed a number of explanations or proofs to evidence its existence. However our above elementary particle model in physics does not support the existence of any unusual kinds of dark matter particles. May, it is a phenomenon of normal gas state molecules or their tiny particles that tenuously (at low order infinitesimal) spread in vast universal space (at higher order infinity) with extremely cold temperature, like clouds floating in the sky and we guess it is the most probable case, unless it was proved wrong by evidence.

According to our model, the long acting force between planets can only be attractive; there would be no universal repulsive force law due to its mechanism of instant dipole-dipole interaction.

It must be emphasized that the mechanism of gravitation here is seemly like that of dispersion force in chemistry; however, they are quite different and can't be confused. The dispersion force between molecules has instant dipole moment of as much as about $10^{-30} \, \text{C m}$ in their molecules; it is not a normal one, but molecule's collision that caused the biggish instant dipole, as well it can be named as collision instant dipole here in order to distinguish.

Though our model accommodates Kaluza-Klein's idea, however we used only space dimensions of usually four for describing the universe, otherwise the five's where needed in Kaluza-Klein's and there the fifth dimension was declared to be circled and curled up within a radius of $10^{-32} \, \text{m}$. In this regard, we uphold the attitude of further thinking.

Neutrino is a special non-matter particle of amphibious. It moves with the speed near light. Its most rest mass energy is converted in forms of kinetic energy; so the explanations of neutrino concerned properties are interesting problems in science.

There is no so what strong charge and weak charge where superstring theory needed. The strong and weak forces between nuclei are not mentioned above. They are indeed overlapped wave interactions and can also be included in our unified field model; it would as well be described in later paper.

As a perfect theoretical system, our present works need further developing. To elementary matter particles, the problems of the stability and the size in space need to be solved in future (FIG. 3).

Finally, we appreciate those people who come to the recognitions of the world view of our theoretical system.

Conclusion

There are no interactions arisen from mass feature. The origin of gravitation between planets is instant dipole-dipole interaction; the gravitation and electromagnetism is then unified. The gravity constant is not a universal constant; it is depends upon temperature, planet's atomic component and the existent forms of their matter. Unusual kinds of dark matter particles are not recommended to exist. The dispersion force in chemistry does not root in their normal instant dipole but collision instant dipole. The four dimensional space-time is necessary and sufficient to the universe at present describing situations of this paper.
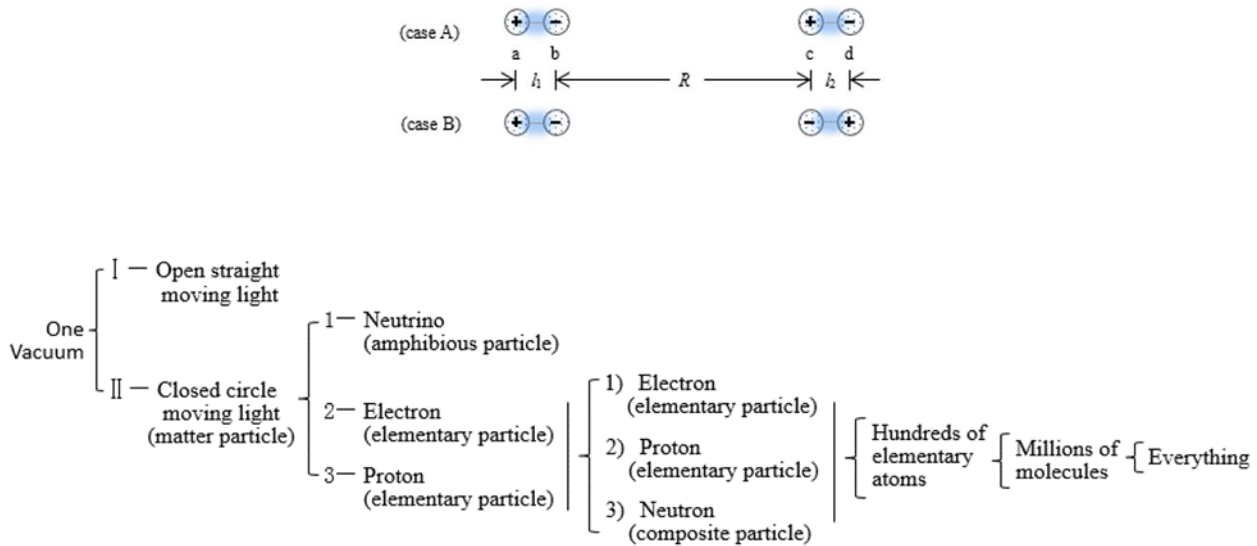

FIG. 3. **Four dimensional space-time.**

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