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Article

Unification of Strong-Weak Interactions and Final Simplest Model of Smallest Particles

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Abstract: First, strong and weak interactions as short-range should be unified. Except different action ranges their main character is: strong interactions are attraction each other, and weak interactions are mutual repulsion and derive decay. We propose a new method on their unification, whose coupling constants are negative and positive, respectively. Further, we research a figure on the unification of the four basic interactions in three-dimensional space. Second, so far the high energy experiments in the past sixty years have shown that the smallest mass fermions are proton, electron, neutrino and photon, which form the simplest model of particles. These fermions seem to be inseparable truth "atoms" (elements), because further experiments derive particles with bigger mass. They correspond to four interactions, and are also only stable particles. Third, the final simplest theory is based on leptons (e-ν_e) and nucleons (p-n) or (u-d) in quark model with SU(2) symmetry and corresponding Yang-Mills field. Other particles and quark-lepton are their excited states. The simplest interactions and simplified QCD are discussed. Finally, we discuss some possibly developed directions of particle physics, for example, violation of basic principles, and precision and systematization of the simplest model, etc.

Keywords: particle, interaction, unification, coupling constant, final model, simplest theory, quark-lepton, QCD.

1. Introduction

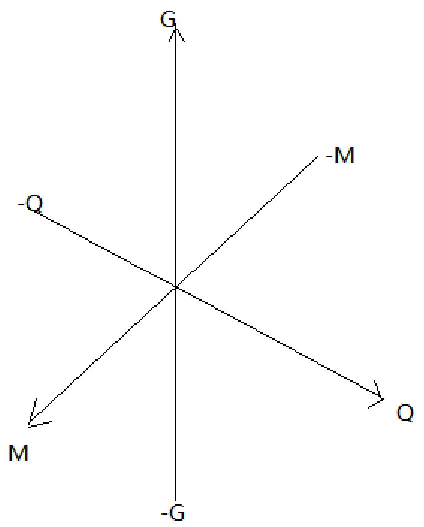
In nature there are four different strong, electromagnetic, weak and gravitational interactions. Their distinction justified by relative strengths. Another important property is the range of interactions. Electromagnetic and gravitational interactions have infinite range. Strong and weak interactions have short range, and weak interaction possesses the shortest range of all interactions.

At present, accelerators are getting bigger, energy is getting higher, particle mass is getting bigger and bigger. It forms a strange circle and the dilemmas: This is made up of tiny particles from huge particles. The approximate degrees of some theories are increasing, far less than the blackbody radiation, photoelectric effect, atomic spectrum in the early quantum theory, and anomalous magnetic moments and Lamb shift in 1950s. Theory of particle physics seems to appear a big problem!

In this paper, we research unification of strong and weak interactions as short-range and some results of four-interactions, and propose the final simplest model on smallest particles and some possibly developed directions of particle physics.

2. Unification of Strong-Weak Interactions with Short-Range

The unification of various interactions is always an important question in physics, whose mathematical basis in particle physics is the gauge groups from SU(2)×U(1)=U(2) of Weinberg-Salam electroweak unified theory [1] to the Georgi-Glashow SU(5) theory [2], etc. Recently, Beane, et al., discussed the entanglement suppression and emergent symmetries of strong interactions [3]. Leonhardt, et al., studied symmetric nuclear matter from the strong interaction [4]. Granet, et al., proposed a new method on bosons and fermions with the duality between weak and strong interactions in quantum gases [5].



Based on various known unified theories of interactions, strong and weak interactions with all short-range should more be unified. But, so far their unification is almost neglected. Except different action ranges their main character is: strong interactions are attraction each other, which correspond to the quarks confinement; weak interactions are mutual repulsion and derive decay. We proposed a possible method on their unification, whose coupling constants are negative and positive, respectively, and further some possible unified scheme of four-interactions, such as unified gauge group GL(6,C) and corresponding unified Lagrangian forms, and various filed equations, etc [6].

Now some confusion exists on weak interactions. How do weak interactions may overcome strong interactions leading to particle decay? This should be for the shorter distance, and smaller distance corresponds to higher energy. The strength of weak interaction is very small, but it involves all observed particles (hadrons and leptons) except photon. The weak interactions include two types: one determines particle decay, and another exists for interaction of all particles except photon, especially leptons, which are mainly electron-neutrino (e-v) and v-v interactions, and which exchange large mass W and Z, respectively.

We proposed the possible theoretical approach on unification of strong and weak interactions can be 1). The removal of electromagnetic fields from the grand unified theory (GUT) seems to be the easiest way. 2). In the electroweak unified theory the electromagnetic field is transformed into a strong interaction. If the gluon is simplified to one type, it is similar to a photon, and can be obtained as a similar electroweak unified theory. 3). The juxtaposed strong and weak interactions and their interactions each other. 4). The best way seems to transform each other with distance, energy-momentum, and action strength, etc., so the interaction direction and coupling constants are opposite.

Now we propose a new possible method on their unification, whose coupling constants are negative and positive, respectively. Any attract forces cannot obtain decay of particles. In particle physics strong and weak interactions should be determined by opposite coupling constants.

When the distance of strong interaction decreases, it is asymptotic freedom, i.e., no interaction. They correspond to that strong interaction, SU(3) and QCD first become zero along with distance decrease. When the distance becomes smaller, it becomes weak interaction, SU(2) and QWD (quantum weak dynamics), and derive decay. It has a critical point of transformation between strong and weak interactions. Probably it may include electromagnetic interactions.

In QCD, the function [7]

$$\beta(g) = -\frac{g^3}{16\pi^2}(11 - \frac{2}{3}N_q) + O(g^5), \qquad (1)$$

where N_q is the number of quark flavors. 1. If g>0, β<0; if g<0, β>0; if g=0, β=0. 2. For g>0, if N_q <33/2, β<0; if N_q>33/2 which may not possible, β>0; if N_q=33/2, β=0. Usual function $\beta(g_l)$ depends on the running coupling g_l [8-10]. $\beta(g_l)$ may be positive or negative or 0.

Fig.1 is namely Fig.18.5(b) [9], $\beta(g_l)$<0 (for q> g_l>0), $\beta(g_l)$=0 (when g_l=q), and $\beta(g_l)$>0 (for g_l>q). This may also be $\beta(g) \to -\beta(g_l)$ and $g_* \to q$ [8]. It may describe unification of strong and weak interactions [6].

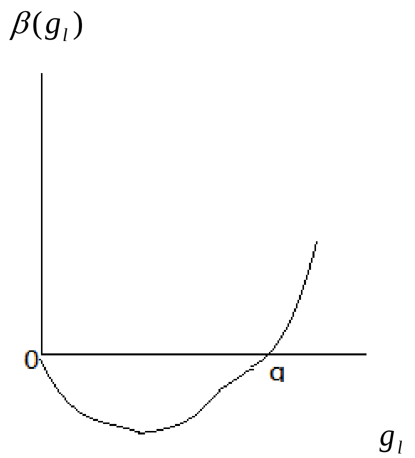


Fig.1. g_l - $\beta(g_l)$ that is Fig.18.5(b) [9]..

The coupling constant of strong interaction for SU(3) and QCD is [10]:

$$\alpha_s(\mathrm{Q}^2) = \frac{12\pi}{(33-2N_f)\ln(Q^2/\Lambda^2)}. \qquad (2)$$

When energy $Q^2 \to \infty$ (or shorter range), the coupling constant of strong interaction $\alpha_S(Q^2)$→0, i.e., the asymptotically freedom, which is the biggest characteristic of the QCD. Further, reduction of distance should be weak interaction with repulsive force. It is from infrared attraction to ultra-violet repulsion, and can be the unity of strong and weak interactions with short-range [6].

General N_f <33/2, α_s >0 for Q>Λ. Strong-weak interactions and QED may be unified by $g_0^2\delta$, in which δ >0 for QCD, δ <0 for SU(2), and δ =0 for QED [9]. Let N_f =33/2, α_s =∞. Let N_f =6 and β =0, α_f =12.726 is an inflection point, from infrared attraction to ultra-violet repulsion [10].

For weak interaction, SU(2) and QWD, the coupling constant should be the same change with Eq.(2). The known Fermi coupling constant $G_F/(\hbar c)^3 = 1.16637\times10^{-5} GeV^{-2}$ <0. For Eq.(2) if N_f >11, α_w <0; or α_w <0 for Q<Λ. If N_f <11, α_w decrease for Q>Λ; when Q→∞, α_w →0 is the asymptotic freedom; when Q=Λ, α_w is an inflection point; α_w increase for Q<Λ. Probably, it corresponds to the "strong decay". Assume that N_f =2, if $\ln(Q/\Lambda) < -(\pi/3\alpha)$, it will be α_w <0. If α =1, $Q < \Lambda e^{-1.05}$. If α =15 is strong coupling constant, $Q < \Lambda e^{-0.07}$.

For QED and U(1), if N_f =2, α_{em} increase for Q>Λ; when Q→∞, α_{em} →0 is the asymptotic freedom; when Q=Λ, α_{em} is an inflection point; α decrease for Q<Λ. If $\ln(Q/\Lambda) > (3\pi/4\alpha)$, it will be α_{em} <0. If α =1, $Q > \Lambda e^{2.355}$. If α =15 is strong coupling constant, $Q > \Lambda e^{0.157}$. For QED, β function is positive. But, for Yang-Mills (YM) field and strong interaction, β function is negative. For weak interaction, β function should be positive. So β function is related to QCD and QWD, and unified strong and weak interactions [6].

Further, when strong interaction becomes weak interaction and electromagnetic interaction, the scaling parameter Λ as the earliest cutoff factors linked to the renormalization process should be changeable, for example, $\Lambda = m_e$ for QED [10].

It is known that the short-range potential $V(r) = g_0 e^{-mr} / r$, in which the coupling constant g_0 <0 is attraction and strong interaction, and g_0 >0 is repulsion and weak interaction, and g_0 =0 corresponds to the asymptotic freedom. Quarks confinement corresponds to a large scale of strong interactions. Strong interactions exist between hadrons, and QCD tends to asymptotically freedom and to mutually repulsive weak interactions inside hadrons. Thus two short-range interactions are unified. Gluon (meson) and W-Z boson are unified. This no interaction is must go through inevitable transition from strong interaction to weak interaction with the smaller scale of mutual repulsion.

The strong interactions are attraction each other, whose scale are about $10^{-13} \sim 10^{-15}$ cm in atomic nucleus and nucleon. The weak interactions are mutual repulsion and derive decay, whose scale are about $10^{-15} \sim 10^{-17}$ cm, since mass 80.4 (91.2)GeV of $W^{\pm}$ (Z) of 'Yukawa-type' exchange particle between weak interactions are 100s times of mass 137 (496)MeV of π (K) of exchange particle between strong interaction. We calculated the weak interaction range about 1.604×10^{-16} cm [11]. From strong interaction to weak interaction there is a process along with range decrease and energy increase, and must be the existence of zero interaction, i.e., the asymptotic freedom.

Gauge group $SU(3)_c \times SU(2)_w$ of unified strong and weak interactions has two coupling constants g_s and g_w. This can be reduced to SU(4), where the fourth row corresponds to W-Z and weak interaction. It is the first generation quark-lepton u, d; e, v, or d_i (i is 3 colors); e, v. It is a 3 rank group with 15 generating elements. The two ways may be field theories and QCD methods that describe different interactions.

The long-range color force is screened by the plasma and becomes short-range, and is manifested by the quark-gluon plasma whose interaction strength α_s becomes smaller [12].

Based on Dirac's negative energy state, we developed to the negative matter as the simplest candidate of dark matter and dark energy [13-20], and proposed some tests and a judgment test [19,20]. Further, we proposed the most perfect symmetrical world on the four types of positive, opposite, and negative, negative-opposite matters (Fig.2).

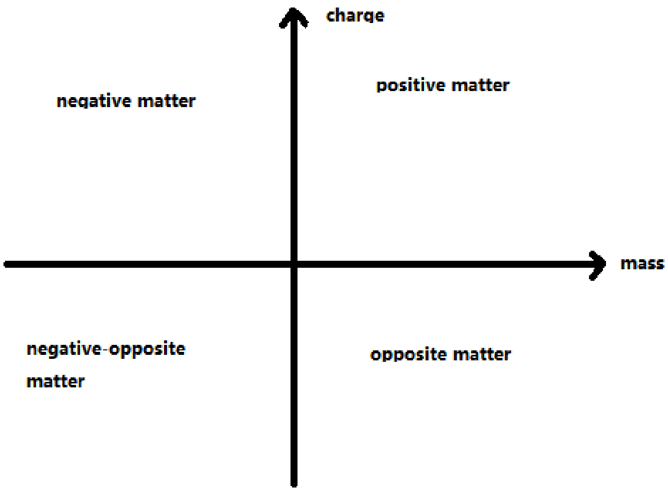


Fig. 2. A new most perfect symmetrical world

Fig. 2 as a two-dimensional plane also corresponds to gravitational and electromagnetic fields determined by mass and charge, respectively. We may combine the four known fundamental interactions to develop into the four-dimensional space. But in some respect, this can be simplified to three-dimensional space, where the third dimension is assumed to be the strong and weak interactions of the short-range. The strong interactions are attraction each other, and the weak interactions are mutual repulsion, both correspond to the coupling constant $G=-g_0>0$ of the upper sides, and G<0 of the lower side, respectively. The two aspects are QCD with SU (3) and QWD with SU (2), and may be unified by the YM gauge field, and between them is asymptotically free G=0, so that Fig. 3 can describe the unification of the four basic interactions in three-dimensional space.

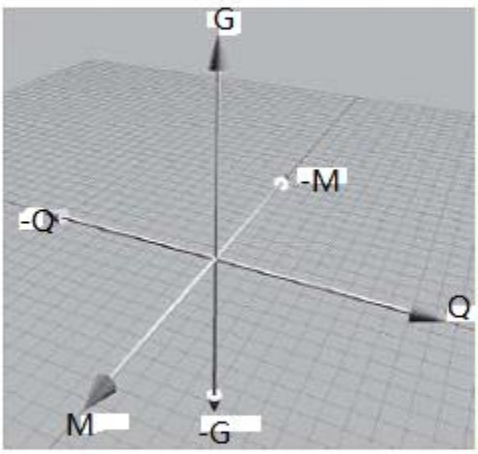


Fig. 3. The unification on the four basic interactions in three-dimensional space

We researched some predictions of these unifications, and known experiments and possible test [6]. It shows clearly that weak interaction appears for higher energy and shorter range. It is consistent completely with those experiments show the scattering in the quark-parton model, and they indicate a strong repulsion at a smaller distance.

3. The Simplest Model of the Smallest Particles

The particle physics is essentially an experimental science. Mesons from 135MeV(π^0) to 125GeV(Higgs boson found in 2012) across 10^3. Hadrons from 135MeV and 938MeV(p) to 6046MeV(Ω_b^- baryon) and its four excited states with 6316-6350MeV [21] across 50 times. Quarks from 1.5-3.0MeV(u) to 174GeV(t) across 10^5, and the mass difference of quark-lepton in the same generation and the corresponding symmetry breaking are bigger and bigger.

1988 Nobel Physics Prize gainer L. Lederman, et al., pointed out that we only must be u and d for quark model, both are composed nucleons p and n. Other particles are electron e and neutrino ν_e [22]. In fact first generation of quark-lepton in standard model (u,d; e, ν_e) constructs the whole stability world. 2004 Nobel Physics Prize gainer Wilczek proposed that standard model should reasonably be called the core theory [23,24].

So far the high energy experiments in the past sixty years have shown that the smallest mass fermions are proton, electron, neutrino ν_e and photon, only which are stable, other particles all decay. They form the simplest model of particles [25]. These fermions seem to be inseparable truth "atoms" (elements), because further experiments derive particles with bigger mass from hyperons to Ω_b^- by accelerators at huge energy. They are also the smallest masses fermions with strong, electromagnetic and weak interactions, and $m(\nu_e) \approx 0$, $m(\gamma) = 0$, and correspond to four interactions, and are also only stable particles. Later particles are their complete symmetric excited states, so they decay to the ground state, such as $\mu \to e\bar{\nu}\nu_\mu$ and $\pi^\pm \to \mu\nu$, which are strong interactions become into electromagnetic and weak interactions. Then there are particles with higher energy and bigger mass. It is also results of current high energy experiments.

Free quark cannot be separated and nucleons cannot be broken down again should suggest that quarks are probably true inseparable, where only the composition of three quarks is stable, and correspond to the baryon number conservation. The main thrust result is mesons (quark pair), such as $\gamma + p \to \rho^0 + p$, and $\pi^- + p \to K^0 + \Lambda$, then $\Lambda \to p\pi^-, \to n\pi^0$. So most of particles produced at high-energy are mesons.

The bootstrap mechanism [26] has the rationality, whose basis is that all particles are combined each other, and their elements correspond to the first generation leptons (e, ν_e) and quarks (u, d), which may develop to nucleons (p-n, I=1/2). Then they are some excited states. For example, muon as heavy electron cannot be a point particle because $\mu \to e\bar{\nu}\nu_\mu$, and it is an excited electron. So is also lepton τ.

4. The Simplest Theory

Arkani-Hamed, et al., searched the simplest quantum field theory [27]. Faced to very complex particle physics, firstly we must distinguish carefully the experimental results (for example, mass, lifetime, decay modes and various scattering data, etc.) and primary theories which are proved by some basic experiments, and other secondary theories, which are only mathematical or physical hypothesis or deduction [25].

Basic states of all particles are photon, leptons (e-ν_e) and nucleons (p-n) or (u-d) in quark model. The most basis corresponds to the symmetry SU(2) with I=1/2 (p-n) and quarks (u-d), and SU(2) with leptons (e-ν_e). Other particles and second-third generations of quark-lepton are their excited states. These SU(2) are all the isospin I violated due to electromagnetic interaction. Two SU(2) are symmetry and unification. The nucleons are composed of three inseparable quarks p=uud and n=udd. Two charges of (p-n) and (e-ν_e) are +1 and -1, respectively. First generation quark-lepton are three colors and eight particles, and total charge is all 3(u+d)+e+ν_e=0.

SU(2) corresponds to Yang-Mills field equation. This is a symmetric field, and corresponds to mesons $\pi^{\pm},\pi^0$ of strong interaction and symmetric bosons $W^{\pm},Z$ of weak interaction. $\pi^{\pm},\pi^0$ are mesons and hadrons with the smallest mass, both mass difference is 4.59MeV. Mass of $W^{\pm},Z$ difference is -10.79GeV.

If electromagnetic interactions are neglected, nucleon-quark and lepton are respectively strong and weak interactions, and latter parity P violation. Photon and graviton (spin J=1,2) are possibly a pairs, or graviton and repulson (spin J=2, -2) are a pairs. But, mass of quark model is uncertainty, for example, m(u)=1.5-3.0MeV and m(d)=3-7MeV, so how to form proton and neutron? Both mass difference is n-p=ddu-duu=du(d-u)=1.29MeV. Proton and electron are Dirac equations only with different masses, whose development is the unified field equation [28]. Neutrino is Weyl equation with m=0, photon is Maxwell equation.

In particle physics three main interactions are electromagnetic, strong and weak ones. The basic equation of quantum mechanics is the non-relativistic Schrödinger equation:

$$i\hbar\frac{\partial\psi}{\partial t}=(-\frac{\hbar^2}{2m}\nabla^2+U)\psi\ . \tag{3}$$

The time-independent Schrödinger equation is:

$$\nabla^2\psi+\frac{2m}{\hbar^2}(E-U)\psi=0\ . \tag{4}$$

In the central field Schrödinger equation is:

$$\frac{d^2\psi}{dr^2}+[-\frac{K(K+1)}{r^2}+\frac{2m}{\hbar^2}(E-U)]\psi=0. \quad (5)$$

Coulomb potential of electromagnetic interaction is:

$$\mathrm{U_{co}}=-\frac{Q^2}{r}. \quad (6)$$

It may derive the well-known Bohr atomic energy level and spectrum, which corresponds to the mass formula. Energy levels are continuous for E>0, and are discrete spectra for E<0. For general electromagnetic interaction $\mathrm{p}_\mu \to \mathrm{p}_\mu - \frac{e}{c}\mathrm{A}_\mu$, it may obtain Aharanov-Bohm (A-B) effect, etc.

Yukawa potential of strong interaction is:

$$\mathrm{U_s}=-g_s\frac{e^{-mr}}{r}, \quad (7)$$

$$\mathrm{U_s}\approx -g_s(\frac{1}{r}-m+m^2r-m^3r^2+m^4r^3-...). \quad (8)$$

It is a unifying potential, which includes already Coulomb potential (first term and m=0), constant potential (second term), linear potential (third term), and the potential of the anharmonic oscillator [29,30] (fourth and fifth terms):

$$U(r)=\frac{1}{2}m\omega^2r^2+\alpha r^3. \quad (9)$$

We derived the mass formula for leptons-meson, and GMO mass formula and its modified accurate mass formula and the symmetrical lifetime formulas of hyperons-mesons [31-34]. Assume that hadrons are formed from the emergence string, these formulas may be obtained exactly [32]. They agree better with experiments, and may extend to describe masses and lifetime of heavy flavor hadrons.

For the potential of weak interaction

$$\mathrm{U_w}=-g_w\frac{e^{-Mr}}{r}\approx\varepsilon\cong 0. \quad (10)$$

It is cause very small g_w and very big M(W-Z). Decays are $A\to B+C+D+...$, whose final results are all stable particles p, e, ν_e and photon.

Rydberg energy is $R_H=\frac{1}{2}\alpha^2\mu_H=3.28805128\times 10^9 MHz$. Weak interaction connects to Lamb shift: $10^{-6}R_H \approx ag_wR_H$, and hyper Lamb shift (HLS) [35,36]. For the anomalous magnetic moments μ of electron, the experimental value is μ=1.0011596521859, and the theoretical μ=1.001159652460 by the renormalization theory [37]. For the muon magnetic moment, the experimental value is

$\mu_\mu = 1.0011659208(6)\frac{e\hbar}{2m_\mu}$, the theoretical calculation is $\mu_\mu = 1.00116546\frac{e\hbar}{2m_\mu}$ [38]. These are all very precise.

The unifying potential (8) includes

$$\mathrm{U_s} \approx mg_s - \frac{g_s}{r} + g_s m^2 r \text{, and } V = -\frac{a}{r} + br . \quad (11)$$

By Schrödinger equation this potential may describe $J/\psi, \psi'$ and Υ, Υ' mesons, and of quarkonium ($c\bar{c}, b\bar{b}$, etc) [39-45]. Buchmuller, et al., used a similar QCD potential [46,47].

Based on the time-space operators of energy-momentum representation in quantum mechanics, we discussed the space-time operators and their generalization, and proposed some operator equations of general relativity and special relativity. Further, we researched some applications of this method, in particular, the lifetime formulas of particles are obtained from the time equation [48], and they agree better with the experimental data [49]. The width formula and mass formula are symmetry [31,32]. Both are all strong interaction. This is the simplest unifying quantum theory and general relativity, and corresponds to the extensive quantum theory, and this is the combination and unification on quantum mechanics and general relativity [50,25].

It is known that Dirac equation may obtain the fine structure of spectrum, electron spin s=1/2, intrinsic magnetic moment, and spin-orbit coupling (Thomas term) and so on. We proposed that Bose-Einstein (BE) and Fermi-Dirac (FD) distributions are derived from the nonlinear Klein-Gordon (KG) equation and nonlinear Dirac equation, and both may be unified [31,51].

There is a strong similarity between the nucleon and lepton coupling [52]. It is namely similarity between strong and weak interactions. Another aspect is well-known theories QED and QCD [53], etc. It can be divided into fermions, Dirac equation and bosons, KG equation, and two representations. But, these equations describe usually free particles. This may develop to unified equations of fermion and boson [52] and interactions and momentum representation.

Proton p and neutron n consists not of others, but of nuclei. For nuclei the average field is used by Woods-Saxon potential. This has also the saturation. Both add electrons are atoms. A basic reaction is $n \to pe\bar{\nu}_e$, which passes through weak interaction, and derives three basic fermions p, e and neutrino.

For leptons, on the one hand, the three generations leptons are I=1/2 symmetry; on the other hand, the mass difference of the same generation (*l*, v) is increasing. ($W^\pm, Z$) corresponds to (e, ν_e). But, weak interactions (zero mass ν_e-ν_e) and (very small mass e-ν_e) exchange $W^\pm, Z$ with huge mass, it is surprising.

5. The Simplest Interactions and Simplified QCD

QCD is the modern theory of strong interactions, and is a non-Abelian theory based on the gauge group SU(3) [54]. The most general renormalizable Lagrangian for QCD is [54]:

$$L=-\frac{1}{4}F_{\alpha}^{\mu\nu}F_{\alpha\mu\nu}-\sum_{n}\overline{\psi}_{n}[\partial-igA_{\alpha}t_{\alpha}+m_{n}]\psi_{n}\ . \qquad (12)$$

Here A_α is the color gauge vector potential, and g is the strong coupling constant.

Strong interaction exists between quarks u and d. This description must only a simplified QCD for u-d. Electromagnetic interaction exists between quarks u-d and e. Weak interaction exists among all quarks and leptons.

Various interacting particles are gluon g with I(J)=0(1), photon γ and W^{+},Z^{0}, in which the simplest model has only four particles. The best important real fermions are four: p, n, e and ν_e. Strong interactions between nucleons (p, n) pass through π^{+},π^{0}. Electromagnetic interactions between nucleons and electrons pass through photon γ. Weak interaction among all nucleons and leptons pass through W^{+},Z^{0}. It adds again graviton, and then are six particles.

Only consider two quarks (u,d), $\psi=\begin{bmatrix}u\\d\end{bmatrix}$. If m is not 0, it will be Dirac equation. Mass of electron is very small, and m=0 has the isospin SU(2) and chiral symmetry. For Goldstone particle SU(2) corresponds to π meson with m is approximately 0; mass is not 0, which corresponds to the partial conservation of axial-vector current (PCAC).

Schrödinger equation with potential may apply to N-body and many-particles [55]. But, so far it remains still problems that the relativistic Klein-Gordon equation and Dirac equation apply to many-particles. This may be: 1. Similar potential, but the description of relativistic potential is difficult. 2. Nonlinearity and interactions. 3. Formation of general relativity. These are also related by quantum field theory. All three correspondence principle is Schrödinger equation with potential. Further, it should combine the nonlocal theory and entangled states. Dyson and Lenard gave proof of “material stability” [56]. Lieb and Thirring made quantitative simplification and great improvement [57], but it still needs deep study [58,59].

It is known that the coupling constant of strong interaction is $g^2/4\pi\cong 15$, the coupling constant of weak interaction is $\cong 10^{-6}$. The range of strong interaction is $m_\pi^{-1}\cong 1.4\times 10^{-13}$cm [60], the range of weak interaction should be $m_{WZ}^{-1}\approx 2\times 10^{-16}$cm. When distance is reduced to this range, and corresponding energy increase, weak interaction will play a main role: repulsion each other and decay. This may be the reason why particles cannot be separable.

In a word, the final simplest theory is based on leptons (e-ν_e) and nucleons (p-n) or (u-d) in quark model with SU(2) symmetry and corresponding Yang-Mills field. Other particles and quark-lepton are their excited states. Their spectrum is mass formula and symmetric lifetime formula. These correspond to the simplest interactions and simplified QCD [25]. In fact, this theory is already the simplified theory of everything. This should correspond also to the dreams of a final theory [61].

6. Conclusion

Except continue to probe various particles of the standard model, which is the current mainstream of high energy physics. We discussed some possibly developed directions of particle physics [25], for example, possible violations of some basic principles violation of basic principles, and precision and systematization of the simplest model, research of the extensive quantum theory, and beyond the smallest standard model are the known CP asymmetry, Higgs mechanism and hierarchy problem, neutrino oscillations, supersymmetry and so on. Moreover, there are other new possible developments.

This model agrees with the Occam's razor, and with inference to the best explanation. From ancient Greek philosophers to great scientists Newton, R. Boyle and J. Dalton believed that matter is composed of inseparable basic units. But, it lacks reliable evidence, and is constantly broken through. Now sixty years of scientific development seem to prove this clear conclusion, and it is also an edge of knowledge [62].

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