4G model of final unification - A very brief report

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Abstract: To understand the mystery of final unification, in our earlier publications, we proposed that, 1) There exist three atomic gravitational constants associated with electroweak, strong and electromagnetic interactions; 2) There exists a strong interaction elementary charge in such a way that, it's squared ratio with normal elementary charge is close to inverse of the strong coupling constant; and 3) Considering a fermion-boson mass ratio of 2.27, quarks can be split into quark fermions and quark bosons. Further, we noticed that, electroweak field seems to be operated by a primordial massive fermion of rest energy 584.725 GeV and hadron masses seem to be generated by a new hadronic fermion of rest energy 103.4 GeV. In this context, starting from lepton rest masses to stellar masses, we have developed many interesting and workable relations. With further study, a workable model of final unification can be developed.

Key words: Four gravitational constants; Strong nuclear charge; Electroweak fermion; Hadron mass generator; Super symmetry;

Nomenclature	
1) Newtonian gravitational constant = G_N	9) Strong coupling constant = α_s
2) Electromagnetic gravitational constant = G_e	10) Elementary charge = e
3) Nuclear gravitational constant = G_s	11) Strong elementary charge = e_s
4) Weak gravitational constant = G_W	12) Mass of proton = m_p
5) Fermi's weak coupling constant = G_F	13) Mass of electron = m_e
6) New electroweak fermion = M_{wf}	14) Fermion-boson mass ratio = Ψ
7) Reduced Planck's constant = $\hbar$	15) Hadron mass generator = M_{hf}
8) Speed of light = c	

1. Introduction

Even though celestial objects that show gravity are confirmed to be made up of so many atoms, so far scientists could not find any relation in between gravity and the atomic interactions at quantum gravity level [1,2]. Black hole temperature point of view [3], strong interaction point of view [4-7] and electroweak interaction point of view [8], scientists found very interesting similarities in between gravity and quantum phenomena. Quantum cosmology point of view [9] and nuclear quantum gravity point of view [10-20], we could develop workable ideas, concepts and relations. Super symmetry point of view [21-24], we proposed a method for understanding baryon and meson masses. On a whole, workability is still lagging. It clearly indicates that, there is something wrong in our notion of understanding or there is something missing in developing the unified physical concepts and needs a critical review at fundamental level. In this context, we hope that, electroweak scale [25,26,27] can certainly yield useful stuff.

2. Basic assumptions

1) Each atomic interaction is associated with a characteristic gravitational coupling constant.
2) There exists a characteristic electroweak fermion of rest energy [18], $M_{wf}c^2 \cong 584.725$ GeV. It can be considered as the zygote of all elementary particles.

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3) Fermi's weak coupling constant (G_F) can be considered as the basic unified coupling constant.
4) There exists a strong interaction elementary charge (e_s) in such a way that, it's squared ratio with normal elementary charge is close to inverse of the strong coupling constant [28].
5) There exists a hadronic fermion of rest energy $M_{hf}c^2 \cong 103.4$ GeV. It can be called as hadron mass generator.
6) Fermion - boson mass ratio is, $\Psi \cong 2.27$.

3. Characteristic unified relations

Based on the above points, we propose the following new and workable relations.

$$\hbar c \cong G_w M_{wf}^2 \cong \sqrt{G_F\left(\frac{c^4}{4G_w}\right)} \Rightarrow \hbar \cong \frac{G_w M_{wf}^2}{c} \cong \sqrt{\frac{G_F c^2}{4G_w}} \quad (1)$$

where $\left(\frac{c^4}{4G_w}\right) \cong 6.9401\times10^{10}$ N is the characteristic force associated with electroweak interaction.

$$m_e \cong \left(\frac{G_w}{G_s}\right) M_{wf} \quad (2)$$

$$m_p \cong \left(\frac{G_s}{G_w}\right)\left(\frac{G_s}{G_e}\right) M_w \cong \left(\frac{G_s^2}{G_w G_e}\right) M_{wf} \quad (3)$$

$$\frac{M_{wf}}{m_e} \cong \frac{G_w^{5/2} G_e^{5/3}}{G_s^4 G_N^{1/6}} \quad (4)$$

$$\frac{M_{wf}}{m_p} \cong \frac{G_s^{1/2} G_e^{1/6} G_N^{1/12}}{G_w^{3/4}} \quad (5)$$

$$\frac{m_p}{m_e} \cong \frac{G_w^{13/4} G_e^{3/2}}{G_s^{9/2} G_N^{1/4}} \cong \frac{G_s^3}{G_w^2 G_e} \quad (6)$$

4. Specific unified relations connected with (G_e, G_s, G_w, G_N)

In a semi empirical approach,

$$\frac{m_p}{m_e} \cong 2\pi\sqrt{\frac{4\pi\varepsilon_0 G_e m_e^2}{e^2}} \quad (7)$$

$$\text{8A)}\ \frac{m_p}{m_e} \cong \left(\frac{G_s m_p^2}{\hbar c}\right)\left(\frac{G_e m_e^2}{\hbar c}\right)$$

$$\text{8B)}\ \frac{m_p}{m_e} \cong \left(\frac{e_s^2}{4\pi\varepsilon_0 G_s m_p^2}\right) \Big/ \left(\frac{e^2}{4\pi\varepsilon_0 G_e m_e^2}\right) \quad (8)$$

$$\text{8C)}\ \frac{e_s}{e} \cong \sqrt{\frac{1}{\alpha_s}} \cong \left(\frac{G_s m_p^2}{\hbar c}\right) \cong \sqrt{\frac{G_s m_p^3}{G_e m_e^3}} \cong \left(\frac{G_s^5}{G_e^2 G_w^3}\right)$$

$$G_N \cong \left(\frac{m_e}{m_p}\right)^{10} G_w \cong \frac{G_w^{21} G_e^{10}}{G_s^{30}} \quad (9)$$

Based on these relations,

On step-by-step,
1) Based on relation (7), (G_e) can be estimated.
2) Based on relation (8A), (G_s) can be estimated.
3) Based on relation (6), (G_w) can be estimated.
4) Based on relation (9), (G_N) can be estimated.
5) Based on relation (8), (α_s, e_s) can be estimated.
6) Based on relation (1), (G_F) can be estimated.

Thus, quantitatively,

$$G_e \cong 2.374335\times10^{37}\ \text{m}^3\text{kg}^{-1}\text{sec}^{-2}$$
$$G_s \cong 3.329561\times10^{28}\text{m}^3\text{kg}^{-1}\text{sec}^{-2}$$
$$G_w \cong 2.909745\times10^{22}\ \text{m}^3\text{kg}^{-1}\text{sec}^{-2}$$
$$G_N \cong 6.679855\times10^{-11}\ \text{m}^3\text{kg}^{-1}\text{sec}^{-2}$$
$$G_F \cong 1.44021048\times10^{-62}\ \text{J.m}^3$$
$$e_s \cong 2.9463591e$$
$$\alpha_s \cong 0.1151937$$
$$(\alpha_s)^{-1} \cong 8.681032$$

5. To understand the integral nature of electron's angular momentum

Without considering the rest mass of proton, Bohr's theory of Hydrogen atom [29] attempts to explain the discrete spectral lines. On a whole,

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a) If hydrogen atom is characterized by its central mass and central charge,
b) If mass of proton is 1836 times heavier than electron,

then, ignoring proton mass in the calculation of emitted spectral lines seems to be a fundamental snag. Probably it may be the root cause of failure of developing a unified model. With our approach, it is possible to show that,

$$\hbar c \cong \left(\frac{G_w G_e}{G_s}\right) m_p m_e \tag{10}$$

$$\hbar \cong \left(\frac{1}{c}\right)\left(\frac{G_w G_e}{G_s}\right) m_p m_e \tag{11}$$

As per the Bohr's second postulate,

$$\left(m_e v r\right) \cong n\hbar \cong n\left(\frac{1}{c}\right)\left(\frac{G_w G_e}{G_s}\right) m_p m_e \tag{12}$$

where, $n = 1, 2, 3, ..$

It can be inferred as,

$$m_e\left(vr\right) \cong \left[\left(\frac{1}{c}\right)\left(\frac{G_w G_e}{G_s}\right)\left(n m_p\right)\right] m_e \tag{13}$$

Clearly speaking, integral nature of m_p i.e. m_p, $2m_p$, $3m_p$,.. nm_p, seems to be responsible for the integral nature of electron's angular momentum. This explanation seems to be very natural and very simple.

6. Interesting outcomes

1) Mystery of H-bar and integral nature of angular momentum [29] can be understood [30].
2) Four interaction ranges can be understood with a common expression [31].
3) Nuclear stability line can be understood with proton number [18,19,32].
4) Nuclear binding energy can be understood with 3 simple terms having single energy coefficient [18,19,32].
5) Nuclear charge radii can be fitted with a simple formula [13,33].
6) Nuclear magic numbers can be understood with quarks [32].
7) Proton and electron rest masses can be fitted.
8) Neutron and proton rest masses can be fitted [21-24].
9) Based on strong charge conservation and Super Symmetry, fractional charge quarks can be understood [34].
10) Quark fermion and quark boson masses can be estimated [21-24].
11) Baryon and meson masses can be fitted with Fluons and Bluons respectively [31].
12) Charged lepton masses and 3.5 keV galactic photons can be fitted [34,35,36,37].
13) Electroweak particle masses can be fitted[34].
14) Elementary particle melting points can be understood [5,34].
15) Neutron life time can be fitted [34,38,39,40].
16) Characteristic atomic radius can be fitted [41].
17) Stellar mass limits can be understood [19, 34,42].
18) Stellar magnetic dipole moments can be understood [43].
19) Newtonian gravitational constant can be estimated with atomic physical constants [44,45].
20) Electroweak [25-27] and Planck scales can be studied in a unified manner [34].
21) Nature of dark matter [44] can be studied with 585 GeV electroweak fermion [18].

7. Conclusion

With further study, research and confirming the existence of the proposed $\left(M_{wf}c^2\right)^{\pm} \cong 584.725$ GeV, actual essence of final unification can be understood. Microscopic and macroscopic physical constants can be reviewed in a unified manner.

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