# GEWS interactions in strong nuclear gravity

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**Abstract**

In the atomic or nuclear space, till today no one measured the value of the gravitational constant. To bring down the planck mass scale to the observed elementary particles mass scale a large scale factor is required. Ratio of planck mass and electron mass is close to Avogadro number/$8\pi \cong N/8\pi$. The idea of strong gravity originally referred specifically to mathematical approach of Abdus Salam of unification of gravity and quantum chromo-dynamics, but is now often used for any particle level gravity approach. In this connection it is suggested that, key conceptual link that connects the gravitational force and non-gravitational forces is - the classical force limit $\left(\frac{c^4}{G}\right)$. For mole number of particles, if strength of gravity is $(N.G)$, any one particle's weak force magnitude is $F_W \cong \frac{1}{N} \cdot \left(\frac{c^4}{N.G}\right) \cong \frac{c^4}{N^2 G}$. Ratio of 'classical force limit' and 'weak force magnitude' is $N^2$. This is another significance of Avogadro number. If $R_0 \cong 1.21$ fermi is the nuclear charge radius, to a very good accuracy it is noticed that in

Hydrogen atom, ratio of total energy of electron and nuclear potential is equal to the electromagnetic and gravitational force ratio of electron where the operating gravitational constant is $N^2 G_C$ but not $G_C$. Square root of ratio of strong and weak force magnitudes can be expressed as $2\pi \ln \left(N^2\right)$. With the defined strong and weak force magnitudes observed elementary particles masses and their magnetic moments can be generated. Interesting application is that: characteristic building block of the cosmological dark matter can be quantified in terms of fundamental physical constants. No extra dimensions are required in this new approach.

**Keywords:** Classical gravitational constant, atomic gravitational constant, Avogadro number, grand unification, dark matter, electron rest mass, gram mole, Hydrogen atom, classical force limit, weak force, strong force, proton rest mass, fine structure ratio, Fermi's weak coupling constant, strong coupling constant, electro weak energy scale, semi empirical mass formula.

# 1 Introduction

**As the culmination of his life work, Einstein wished to see a unification of gravity and electromagnetism as aspects of one single force. In modern language he wished to unite electric charge with the gravitational charge (mass) into one single entity. Further, having shown that mass the gravitational charge was connected with space-time curvature, he hoped that the electric charge would likewise be so connected with some other geometrical property of space-time structure. To unify 2 interactions if 5 dimensions are required, for unifying 4 interactions 10 dimensions are required. For 3+1 dimensions if there exists 4 (observed) interactions, for 10 dimensions there may exist 10 (observable) interactions. To unify 10 interactions 20 dimensions are required. This logic seems to indicate that with 'n' new dimensions on may not be able to resolve the problem of unification. More over new problems and new properties will come into picture and makes the 4 dimen-**

**sional unification program more complicated. Right now quantitatively and qualitatively: 1) one can not implement the planck scale in 'atomic' and 'nuclear' space. 2) one can not think about the 'reduced magnitudes' of quantized elementary charge or angular momentum**.

The only one simple alternative for understanding 'unification' is - to think about the 'variation of gravitational constant' or to think about the existence of 'atomic gravitational constant'. Magnitude and existence of the proposed atomic gravitational constant may be 'absolute' or 'relative'. Its existence has to be confirmed by logical analysis. Interesting application is: it helps in finding the characteristic building block of the 'cosmological dark matter'.

## 2 Variation of the classical gravitational constant in cosmology

In understanding the cosmic evolution or the large scale structure of the universe, in his large number hypothesis, Dirac assumed that magnitude of the gravitational constant is inversely proportional to the cosmic time. At the same time he assumed that in the past there was no change in the magnitude of atomic physical constants. J.V.Narlikar in his book explained it in detail [1].

$$G \propto \frac{1}{t}. \tag{1}$$

But cosmic variation of G goes against the concepts of general theory of relativity. Sciama assumed that there exists a relation between inertia and the large scale structure of universe as

$$G \cong \frac{Rc^2}{M}. \tag{2}$$

Brans and Dicke postulated that G behaves as a reciprocal of a scalar field as

$$G \cong \frac{1}{\Phi}. \tag{3}$$

where $\Phi$ is expected to satisfy a scalar wave equation whose source is all the matter in the universe.

Equations (1), (2) and (3) suggests that theoretically it is possible to think about the variation of $G$. Whether the nature of variation is cosmic or there exists two kinds of gravitational constants one for the classical physics and the other for the atomic system- has to be analysed. From modern flat model of cosmology point of view there is no need to consider a variable cosmic gravitational constant. Seshavatharam [2, 3] proposed a unified model of black hole cosmology. From this also it is clear that for understanding the cosmic evolution there is no need to consider the Dirac's view of variable $G$. In this paper this second idea is discussed. Authors humbly say- this concept can successfully be applied in the unification of the four fundamental interactions including the cosmic dark matter. Note that in the atomic or nuclear physics, till today no one measured the gravitational force of attraction between the proton and electron and experimentally no one measured the value of the gravitational constant. Physicists say - if strength of strong interaction is unity, with reference to the strong interaction, strength of gravitation is $10^{-39}$. The fundamental question to be answered is: is mass an inherent property of any elementary particle?

Authors humbly say: for any elementary particle mass is an induced property. This idea makes grand unification easy. Hawking S.W, Abdus Salam, David Gross and Tilman sauer presented a beautiful discussion on Unification ([4],[5],[6],[7]). Note that GTR does not throw any light on the mass generation of charged particles. It only suggests that space-time is curved near the massive celestial objects. More over it couples the cosmic (dust) matter with geometry. But how matter is created? Why and how elementary particle possesses both charge and mass? Such type of questions are not discussed in the frame work of GTR.

It is well known that celestial bodies constitutes so may electrons and nucleons. Clearly speaking mass of the celestial body is an index of how many nucleons it constitutes. The subject of unification is broad in the sense it makes an attempt to understand the origin of 'mass generation' of elementary particles. In this situation one can confidently say - the existing gravitational constant is a consequence of grand unification. Not only that the mysterious concept 'gram mole' can be understood very easily.

In Dirac's model $G$ is large in the past and works for the construction of the universe where as in the charge-mass unification program grand unified $G$ is large and works for the construction of the massive elementary particles.

# 3 Grand unification and the need of atomic gravitational constant

The strong or atomic gravitational constant is the supposed physical constant of strong gravitation, involved in the calculation of the gravitational attraction at the level of elementary particles and atoms. The idea of strong gravity originally referred specifically to mathematical approach of Abdus Salam [8,9,10] of unification of gravity and quantum chromo-dynamics, but is now often used for any particle level gravity approach. In literature one can refer the works of Abdus Salam, C. Sivaram, Sabbata, A.H. Chamseddine, J. Strathdee, Usha Raut, K. P. Sinha, J.J.Perng, E. Recami, R. L. Oldershaw, K.Tennakone, S.I Fisenko and S.G.Fedosion ([11]-[24]).

From the standpoint of 'infinite hierarchical nesting of matter' and Le Sage's theory of gravitation, the presence of two gravitational constants shows the difference between the properties of gravitons and properties of matter at different levels of matter. The strong gravitational constant is also included in the formula describing the nuclear force through strong gravitation and torsion field of rotating particles. A feature of the gravitational induction is that if two bodies rotate along one axis and come close by the force of gravitation, then these bodies will increase the angular velocity of its rotation. In this regard, it is assumed that the nucleons in atomic nuclei rotate at maximum speed. This may explain the equilibrium of the nucleons in atomic nuclei as a balance between the attractive force of strong gravitation and the strong force of the torsion field (of gravito-magnetic forces in gravito-magnetism). Various proposed values of strong gravitational constant are $2.06\times10^{25}$, $6.7\times10^{27}$, $2.18\times10^{28}$, $2.4\times10^{28}$, $3.9\times10^{28}$, $1.514\times10^{29}$, $3.2\times10^{30}$, $5.1\times10^{31}$, $6.9\times10^{31}$ , $2.77\times10^{32}$ $m^3Kg^{-1}sec^{-2}$.

The subject of unification is not new. For Einstein - the existence, the mass, the charge of the electron and the proton, the only elementary particles recognized back in the 1920s, were arbitrary features. One of the main goals of a unified theory should be to explain the existence and calculate the properties of matter. But here the fundamental question to be answered is: without a 'mass content' can electric charge preserve its individual identity? For example even though 'rest mass' of photon is zero it possesses 'energy'. For any elementary charged massive particle - which is more fundamental either the 'mass' or the 'charge'? Here authors humble opinion is : charge can be considered as the fundamental, inherent and characteristic property of the charged massive particle. For the same magnitude of charge, proton's mass is 1836.15 times heaver than the mass of electron. Observed elementary mass spectrum ranges from 0.511 MeV to 182 GeV. But very interesting and surprising observation is that magnitude of charge remains at $e$ or $2e$. How to understand this situation? Concept of quantization of charge states that- in nature 'charge' exists only in integral multiples of $e$.

Stephen Hawking - in his famous book- says: It would be very difficult to construct a complete unified theory of everything in the universe all at one go. So instead we have made progress by finding partial theories that describe a limited range of happenings and by neglecting other effects or approximating them by certain numbers. (Chemistry, for example, allows us to calculate the interactions of atoms, without knowing the internal structure of an atomic nucleus.) Ultimately, however, one would hope to find a complete, consistent, unified theory that would include all these partial theories as approximations, and that did not need to be adjusted to fit the facts by picking the values of certain arbitrary numbers in the theory. The quest for such a theory is known as "the unification of physics". Einstein spent most of his later years unsuccessfully searching for a unified theory, but the time was not ripe: there were partial theories for gravity and the electromagnetic force, but very little was known about the nuclear forces. Moreover, Einstein refused to believe in the reality of quantum mechanics, despite the important role he had played in its development.

The first step in unification is to understand the origin of the rest mass of a charged elementary particle. Second step is to understand the combined effects of its electromagnetic (or charged) and gravitational interactions. Third step is to understand its behaviour with surroundings when it is created. Fourth step is to understand its behaviour with cosmic space-time or other particles. Right from its birth to death, in all these steps the underlying fact is that whether it is a strongly interacting particle or weakly interacting particle, it is having some rest mass. To understand the first 2 steps somehow one must implement the gravitational constant in sub atomic physics. Seshavatharam and Lakshminarayana [25-29] proposed that there may exist coulomb's charged particle of mass-energy

$$M_c c^2 \cong \sqrt{\frac{e^2}{4\pi\epsilon_0}\left(\frac{c^4}{G}\right)} \cong 1.042940852 \times 10^{18}\ GeV. \tag{4}$$

Recalling Einstein's view that 'unification of gravity and electromagnetism as aspects of one single force', considering the classical limit of force $\frac{c^4}{G}$ -its large magnitude play some interesting role in grand unification and general theory of relativity. Seshavatharam [2,3], W.C.Daywitt [30] and N. Harameian [31] discussed its role in Black hole physics, Planck scale physics and General theory of Relativity receptively.

$$M_c \cong \sqrt{\frac{e^2}{4\pi\epsilon_0 G}} \cong 1.859210775 \times 10^{-9}\ Kg. \tag{5}$$

The beauty of this expression is that it generates a 'mass content' from $e$ and $G$. In the sense it is generating 'inertia' in the free space. Here the fundamental questions to be answered are: from where elementary charge is coming into picture? How and why it exists in the universe? How many elementary charges are there in the universe? Is 'coulomb mass' the mother of all the observed charged and neutral elementary massive particles? Qualitatively this obtained mass unit play some role in the generation of elementary particle's rest mass. But from numerical point of view this mass is very large compared to the observed elementary particle's rest mass. Till today in the laboratory no such a particle is observed with such a large mass. To move from this large mass unit to the electron mass one must consider some type of large coupling constant or a proportionality number or a scaling factor. Now the real problem comes into picture. If the scaling factor or proportionality number is a known one, then to some extent - its historical data and physics background makes and brings the unification concepts into one stream. Compared to the current research - it may be in the main streamline or secondary streamline - it can be decided by the future thoughts and experiments.

To have a small mass unit one cannot assume that small massive particle possesses a fractional magnitude of $e$. In CGS system of units value of $4\pi\epsilon_0$ is unity. The only one alternative that must be allowed is - variation of $G$. Inserting a coupling number or proportionality number means- it may be a system constant or interaction constant. The main object of unification is to understand the relation between the three atomic interactions and the gravitational interaction. Ultimately one must co-relate the coupling constant with the gravitational constant. Finally this leads to the concept of the variation of $G$. For each and every elementary particle its corresponding value of $G$ can be expressed as

$$G_m \cong \frac{e^2}{4\pi\epsilon_0 m_x^2}. \tag{6}$$

Here $G_m$ = magnitude of G corresponding to the mass of the particle $m_x$. The interesting point to be noted is that unlike the classical or continuous mass range of celestial massive bodies, elementary particles mass spectrum follows certain quantum rules and hence there exists some governing procedure for the observed mass spectrum. Not only that each interaction is having some coupling constants. Considering leptons three exists only one basic particle- that is electron. Considering hadrons there exists only one stable particle - that is proton. Hence value of $G_m$ can be fixed. If one is able to inter change the coupling constants , there is a possibility of fixing the value of $G_m$. In this way this proposed idea differs from Dirac's proposal of variation of G with cosmic time. Based on Sciama's proposal, in atomic and nuclear physics, with reference to the nuclear mass and size, magnitude of the nuclear characteristic gravitational constant can be given as

$$G_m \cong \frac{R_p c^2}{m_p}. \tag{7}$$

Here, $m_p$ = mass of proton, $R_p$ = size of proton.

To bring down the planck mass scale to the observed elementary particles mass scale a large scale factor is required. Just like relative permeability and relative permittivity by any suitable reason in atomic space or nuclear space if one is able to increase the value of classical gravitational constant, it helps in four ways. Observed elementary particles mass can be generated and grand unification can be achieved. Third important application is characteristic building block of the cosmological 'dark matter' can be quantified in terms of fundamental physical constants. Fourth important application is - no extra dimensions are required. Finally nuclear physics and quantum mechanics can be studied in the view of 'strong nuclear gravity' where nuclear charge and atomic gravitational constant play a crucial role in the nuclear space-time curvature, QCD and quark confinement. Not only that cosmology and particle physics can be studied in a unified way.

In this connection it is suggested that square root of ratio of atomic gravitational constant and classical gravitational is equal to the Avogadro number. Till today there is no explanation for this fantastic large number. It is an observed fact. The very unfortunate thing is that even though it is a large number it is neither implemented in cosmology nor implemented in grand unification. Note that ratio of planck mass and electron mass is close to $\frac{N}{8\pi}$. The Avogadro constant expresses the number of elementary entities per mole of substance. Avogadro's constant is a scaling factor between macroscopic and microscopic (atomic scale) observations of nature.

It can be supposed that elementary particles construction is much more fundamental than the black hole's construction. If one wishes to unify electroweak, strong and gravitational interactions it is a must to implement the classical gravitational constant $G$ in the sub atomic physics. By any reason if one implements the planck scale in elementary particle physics and nuclear physics automatically $G$ comes into subatomic physics. Then a large arbitrary number has to be considered as a proportionality constant. After that its physical significance has to be analysed. Alternatively its equivalent 'strong atomic gravitational constant' can also be assumed. Some attempts have been done in physics history.

Whether it may be real or an equivalent if it is existing as a 'single constant' its physical significance can be understood. 'Nuclear size' can be fitted with 'nuclear Schwarzschild radius'. 'Nucleus' can be considered as 'a strong nuclear black hole'. This idea requires a basic nuclear fermion! Nuclear binding energy constants can be generated directly. Proton-neutron stability can be studied. Origin of 'strong coupling constant' and 'Fermi's weak coupling constant' can be understood. Charged lepton masses can be fitted. Authors feel that these applications can be considered favourable for the proposed assumptions and further analysis can be carried out positively for understanding and developing this proposed 'Avogadro's strong nuclear gravity'.

# 4 Planck scale charged space-time curvature

A characteristic planck scale space-time curvature can be expressed as

$$R_P \cong \sqrt{\frac{e^2}{4\pi\epsilon_0}\left(\frac{G}{c^4}\right)} \cong 1.380677 \times 10^{-36}\ m. \tag{8}$$

General theory of relativity says that space-time is curved at massive bodies surface. Coming to the microscopic physics there exists only one elementary charge. Above expression indicates that under certain unknown and extreme physical conditions space-time is curved near the surface of a charged elementary particle. Here also by inserting a coupling constant or proportionality ratio this small length can be increased to the observed elementary particle's characteristic size. In a reverse way for each and every elementary particle's size its corresponding value of $G_R$ can be expressed as

$$G_R \cong \frac{4\pi\epsilon_0 R_x^2 c^4}{e^2}. \tag{9}$$

where $R_x$ is the size of any elementary particle. Present day experimental physics suggests that leptons has no structure yet all. It means leptons are point particles and there is no definite size. The remaining particles are only stable hadrons or the atomic nucleus. Rutherford's $\alpha$-scattering experiments suggests that there exists a characteristic nuclear unit size. Hence the value of $G_R$ can be fixed based on the nuclear size.

Out of the four observed fundamental interactions, there exists some similarities in between the electromagnetic and gravitational interactions. Both are long range forces and follows inverse square law. In both of these cases field carriers move with speed of light. Grand unification program suggests that in the past during the cosmic evolution all the four interactions are same and possesses same strength. Distance being the same, ratio of electromagnetic force and gravitational force between proton and electron is always

$$r_{eg} \cong \frac{e^2}{4\pi\epsilon_0 G m_p m_e}. \tag{10}$$

Here $m_p$ =mass of proton, $m_e$=mass of electron, $e$ = charge on electron or proton and $r_{eg}$ = electromagnetic and gravitational force ratio. Above idea can be represented as in the past

$$\frac{e^2}{4\pi\epsilon_0 d_e^2} \cong \frac{c^4}{G}. \tag{11}$$

$$\frac{G m_p m_e}{d_g^2} \cong \frac{c^4}{G}. \tag{12}$$

$$\frac{d_e}{d_g} \cong \sqrt{\frac{e^2}{4\pi\epsilon_0 G m_p m_e}}. \tag{13}$$

Here $d_e$=distance between electron and proton as 2 charges and $d_g$ = distance between electron and proton as 2 massive particles.

# 5 Atomic gravitational constant and mystery of dark matter candidate

Modern cosmological observations and analysis clearly suggests that there exists a mysterious matter which can be called as‘dark matter’ and ‘dark energy’. A.J. Frieman, M.S. Turner and D.Huterer explained this in their paper [32]. Please note that existence of ‘dark matter’ is not proposed from particle physics observations. This is a very strange idea. If one is able to find the ‘dark matter’ it will be an indication of ‘unification of the fundamental interactions’. At the beginning ‘dark matter’ existence is guessed from rotational velocities of stars, gas clouds, globular clusters and satellite dwarf galaxies at the periphery of galaxies. In General Relativity, for the universe, accelerated expansion is possible only if there exists ‘dark energy’. There are several other, independent arguments based, in particular, on the estimate of the age of the Universe, structure formation, cluster abundance, CMB anisotropy. All of them point to the existence of 'dark energy' whose density today is at the level of 75% of the critical density.

Please note that till today in modern physics history there is no clear cut mechanism or expression for the generation of dark matter 'mass'. Which particles make non-baryonic clustered dark matter is not known experimentally. One expects that these are stable or almost stable particles that do not exist in the Standard Model of particle physics. Hence, the very existence of dark matter is a very strong argument for incompleteness of the Standard Model. This makes the detection and experimental study of the dark matter particle extremely interesting and important. On the other hand, the lack of experimental information on the properties of these particles makes it impossible to give a unique answer to the question of the mechanism of the dark matter generation in the early Universe.

It is noticed that ratio of planck mass and electron mass is $2.389 \times 10^{22}$ and is 25.2 times smaller than the Avogadro number. It is also noticed that the number 25.2 is close to $8\pi$. Qualitatively this idea implements gravitational constant in particle physics. Note that planck mass is the heaviest mass and neutrino mass is the lightest mass in the known elementary particle mass spectrum. As the mass of neutrino is smaller than the electron mass, ratio of planck mass and neutrino mass will be close to the Avogadro number or crosses the Avogadro number. Since neutrino is an electrically neutral particle if one is able to assume a charged particle close to neutrino mass it opens a window to understand the combined effects of electromagnetic (or charged) and gravitational interactions in sub atomic physics. Compared to planck scale (past cosmic high energy scale), Avogadro number is having some physical significance in the (observed or present low energy scale) fundamental physics or chemistry.

$$\frac{M_P}{m_e} \cong \sqrt{\frac{\hbar c}{G m_e^2}} \cong 2.3892245954 \times 10^{22} \cong \frac{N}{8\pi}. \tag{14}$$

Here, $M_P$ = planck mass and $m_e$ = electron rest mass. Hence electron rest mass can be expressed as

$$m_e \cong \frac{8\pi}{N}\sqrt{\frac{\hbar c}{G}} \cong 8\pi\sqrt{\frac{\hbar c}{N^2 G}} \cong 9.083115709 \times 10^{-31}\ Kg. \tag{15}$$

Accepted value of $m_e = 9.109382154\times10^{-31}\ kg$ and accuracy is 99.7116%. In terms of the above introduced 'coulomb' mass unit it can be expressed as

$$m_e \cong \frac{8\pi}{N\sqrt{\alpha}}\sqrt{\frac{e^2}{4\pi\epsilon_0 G}} \cong \frac{8\pi}{\sqrt{\alpha}}\sqrt{\frac{e^2}{4\pi\epsilon_0\left(N^2G\right)}}. \tag{16}$$

Here it can be assumed that- if $\frac{8\pi}{\sqrt{\alpha}} \cong 294.2098$ is the electromagnetic 'mass induction strength' or 'mass generation strength' then $N^2G \cong G_A$ can be considered as the atomic gravitational constant. In grand unification program this number

$$X_E \cong \frac{8\pi}{\sqrt{\alpha}} \cong \sqrt{\frac{4\pi\epsilon_0\left(N^2G\right)m_e^2}{e^2}} \cong 295.0606338. \tag{17}$$

can be called as the lepton-quark-nucleon gravitational mass generator. It is the utmost fundamental ratio compared to the fine structure ratio $\alpha$. It is noticed that

$$\frac{1}{\alpha} \cong \frac{1}{2}\sqrt{X_E^2 - \left[\ln\left(N^2\right)\right]^2} \cong 136.9930484. \tag{18}$$

This can be compared with 'inverse of the fine structure ratio' $= \frac{1}{\alpha} \cong 137.0359997$. Another strange observation is that

$$\ln\left(\frac{M_c}{m_p}\right) \cong \ln\sqrt{\frac{e^2}{4\pi\epsilon_0 G m_p^2}} \cong \sqrt{\frac{m_p}{m_e} - \ln\left(N^2\right)}. \tag{19}$$

Here $M_c \cong \sqrt{\frac{e^2}{4\pi\epsilon_0 G}}$, $m_p$ is the proton rest mass and $m_e$ is the electron rest mass. $N$ is the Avogadro number and $G$ is the gravitational constant. $\frac{e^2}{4\pi\epsilon_0 G m_p^2}$ is the electromagnetic and gravitational force ratio of proton. Carlo Amedeo Avogadro [33] proposed his famous hypothesis in 1811. P.J. Mohar and B.N.Taylor [34] recommended values are $N = 6.022141793 \times 10^{23}$ and $G_C \cong 6.6742867 \times 10^{-11}\ m^3 Kg^{-1} sec^{-2}$. Here in this equation (19), Lhs = 41.55229152; Rhs = 41.55289244; This is an excellent fit. In grand unification program this type of fitting should not be ignored. This relation clearly suggests that there exists a definite relation between $M_c$, $m_p$, $m_e$ and $N^2$. Considering all the atomic physical constants, obtained value of the gravitational constant is $6.666270179 \times 10^{-11}\ m^3 Kg^{-1} sec^{-2}$. Till today no atomic model implemented the gravitational constant in the atomic or nuclear physics. Then, whatever may be its magnitude, measuring its value from existing atomic principles is impossible. Its value was measured in the lab within a range of 1 cm to 1 meter only where as the observed nuclear size is 1.2 fermi. With reference to the above relations it is possible to define a new mass unit as

$$m_X \cong \sqrt{\frac{e^2}{4\pi\epsilon_0 \left(N^2 G\right)}} \cong 3.087291597 \times 10^{-33}\ Kg. \tag{20}$$

$$m_X c^2 \cong \sqrt{\frac{e^2 c^4}{4\pi\epsilon_0 \left(N^2 G\right)}} \cong \sqrt{\frac{e^2}{4\pi\epsilon_0}\left(\frac{c^4}{N^2 G}\right)} \cong 1.731843735\ KeV. \tag{21}$$

This mass unit is very close the (neutral) neutrino mass. Conceptually this can be compared with the 'charged' dark matter. Note that either in cosmology or particle physics till today there is no clear cut mechanism for understanding the massive origin of the dark matter. Its existence changes the fate of 'modern' thoughts in cosmology and particle physics. In this critical situation proposed ideas can be given a chance.

The fundamental question to be answered is : 1.7318 KeV is a potential or a charged massive particle? If it is a particle its pair annihilation leads to radiation energy. If it is the base particle in elementary particle physics - observed particle rest masses can be fitted. Authors humble opinion is: it can be considered as the basic charged lepton or lepton potential. It can be considered as the basic charged 'dark matter' candidate. Magnitude of $G_A \cong N^2 G = 2.420509614 \times 10^{37}\ m^3 kg^{-1} sec^{-2}$.

At this moment a modern physicist cannot admit this idea. Their view is that this large value of $G$ cannot be incorporated in the GTR or existing physics. This is absolutely true. Absolute lab measurements of $G$ have been made on the scales of about 1 cm to 1 meter only. For any experimental physicist it is a must to measure the magnitude of $G$ in nuclear physics. Without measuring its value how can one say that the same value of $G$ operates in the atomic or nuclear space time curvature. Here the very important question to be answered is: which is more fundamental either $G$ or $N^2G$ ? Authors humble opinion is : both can be considered as the 'head' and 'tail' of matter coin. It can also be suggested that $G$ is a consequence of the existence of $N^2G$. Please note that even if human beings are able to understand the 'absolute findings' they may not be able to make the 'absolute measurements'. In terms of Planck mass its neutral mass unit can be represented as

$$m_P \cong \sqrt{\frac{\hbar c}{(N^2G)}} \cong 3.614056909 \times 10^{-32}\ Kg. \tag{22}$$

$$m_P c^2 \cong \sqrt{\frac{\hbar c^5}{(N^2G)}} \cong \sqrt{\hbar c \left(\frac{c^4}{N^2G}\right)} \cong 20.27337431\ KeV. \tag{23}$$

Considering these expressions for dark matter and with a suitable theoretical model along with a suitable proportionality ratio like the fine structure ratio or the strong coupling constant correct magnitude of dark matter mass unit can be estimated. Most interesting thing is that unless one consider the 'atomic gravitational constant'$= N^2G = G_A$ this is not possible.

## 5.1 Charged lepton rest masses

Let $G_C$ = gravitational constant operating in the free space or universe, $N$ = Avogadro number and $G_A$= gravitational constant operating in the atomic and nuclear system= $N^2G_C$.

Using the above defined number $X_E = 295.0606338$, charged lepton masses can be fitted as

$$m_l c^2 \cong \left[X_E^3 + \left(n^2 X_E\right)^n \sqrt{N}\right]^{\frac{1}{3}} \sqrt{\frac{e^2c^4}{4\pi\epsilon_0 G_A}} \cong \frac{2}{3}\left[E_c^3 + \left(n^2 X_E\right)^n E_a^3\right]^{\frac{1}{3}}. \tag{24}$$

Here n= 0,1, 2. $E_c$ and $E_a$ are the coulombic and asymmetric energy constants of the semi empirical mass formula. Qualitatively this expression is connected with $\beta$ decay. See the following table-1. Please refer M.Yao et al [35] recommended PDG charged lepton masses. If electron mass is fitting at n = 0, muon mass is fitting at n = 1 and tau mass is fitting at n = 2

| n | Obtained Lepton mass, MeV | Exp. Lepton Mass, MeV |
|---|---|---|
| 0 | Defined | 0.510998922 |
| 1 | 105.951 | 105.658369 |
| 2 | 1777.384 | 1776.84 $\pm$0.17 |
| 3 | 42262.415 | to be discovered |

Table 1: Fitting of charged lepton rest masses.

it is quite reasonable and natural to predict a new heavy charged lepton at n = 3. By selecting the proper quantum mechanical rules if one is able to confirm the existence of the number n = 3, existence of the new lepton can be understood. Recent experiments suggests that there exists a 4th flavour neutrino. At n=3 there may exist a heavy charged lepton at 42262 MeV. At this moment one can not deny this prediction. At the same time one must critically examine the proposed relation for its nice and accurate fitting of the 3 observed charged leptons. Unfortunately inputs of this expression are new for the standard model. Hence one can not easily incorporate this expression in standard model. Till now in SM there is no formula for fitting the lepton masses accurately. It indicates the incompleteness of the SM.

## 5.2 Mystery of the gram mole

Authors humble opinion is - Avogadro number is not a pure number. Clearly speaking it is the square root of ratio of strong nuclear gravitational constant and the classical gravitational constant.

$$N \cong \sqrt{\frac{G_A}{G_C}}. \tag{25}$$

In SI system of units why gram mole is being used? This fundamental question can be answered if it is assumed that there exists a limit for the quantum mechanical atomic mass. The definition of 'quantum mechanical atomic mass' can be given as- it is the upper limit for the mass of an elementary particle or mass of a microscopic system or mass of an atom where in the existing quantum mechanical and atomic laws can be applied. If mass of the system crosses the limit, quantum mechanics and atomic structure transforms to classical physical laws. Quantitatively the assumed mass limit can be obtained in the following way.

$$G_A m_p^2 \cong G_C M_X^2. \tag{26}$$

where $m_p$ = operating mass unit in atomic physics = mass of proton and $M_X$ = operating mass unit in classical physics.

$$\left(\frac{M_X}{m_p}\right)^2 \cong N^2. \tag{27}$$

Hence $M_X \cong N \times m_p \cong 1.0072466 \times 10^{-3}\ Kg \cong 1.0072466\ gram$. In this way gram mole can be understood.

# 6 Nuclear charge radius, atomic gravitational constant and the Hydrogen atom

In 1911 under the supervision of Rutherford, H.Giger and E.Marseden [36] for the first time experimentally showed that nuclear size is the order of 1.4 fermi. Later electron scattering experiments revealed that at a distance of $R_0$ from the nuclear center nuclear charge density falls to 50% of its maximum charge density. If $R_0 \cong 1.21$ fermi is the nuclear charge radius, to a very good accuracy it is noticed that in Hydrogen atom, ratio of total energy of electron and nuclear potential is equal to the electromagnetic and gravitational force ratio of electron where the operating gravitational constant is $N^2 G_C$ but not $G_C$. With reference to Bohr's theory of Hydrogen atom, it can be expressed as

$$-\frac{e^2}{8\pi\epsilon_0 a_0} \cong -\frac{e^2}{4\pi\epsilon_0 G_A m_e^2} \times \frac{e^2}{4\pi\epsilon_0 R_0}. \tag{28}$$

Here $a_0$ is the bohr radius of electron in Hydrogen atom and $R_0$ is the nuclear charge radius. This expression clearly confirms the existence of the $G_A \cong N^2 G_C$ in atomic physics.

$$-\frac{e^2}{8\pi\epsilon_0 a_0} \cong -\frac{1}{X_E^2} \times \frac{e^2}{4\pi\epsilon_0 R_0}. \tag{29}$$

$$X_E^2 \cong \frac{e^2}{4\pi\epsilon_0 G_A m_e^2}, \tag{30}$$

can be considered as the ratio of electromagnetic and gravitational forces of electron where the operating gravitational constant is $N^2G_C$ but not $G_C$.

$$a_0 \cong \frac{4\pi\epsilon_0 G_A m_e^2}{2e^2} \times R_0. \tag{31}$$

$$\frac{a_0}{R_0} \cong \frac{4\pi\epsilon_0 G_A m_e^2}{2e^2} \cong \frac{X_E^2}{2}. \tag{32}$$

Revolving electrons basic angular momentum can be expressed as

$$m_e vr \cong \sqrt{\frac{N^2 G_C\ m_e^3\ R_0}{2}} \cong \hbar \cong N\sqrt{\frac{G_C\ m_e^3\ R_0}{2}}. \tag{33}$$

where $r$ is the orbit radius and $v$ orbiting speed. The most important observation is: in atomic physics there exists a grand unified angular momentum and can be expressed as

$$\frac{\hbar}{N} \cong \frac{h}{2\pi N} \cong \sqrt{\frac{G_C\ m_e^3\ R_0}{2}}. \tag{34}$$

where $h$ is the famous planck's constant. The basic quanta of angular momentum is $N$ times of $\sqrt{\frac{G_C\ m_e^3\ R_0}{2}}$. This is a very strange concept that couples the micro-macro physical constants. This can be considered as another definition to the Avogadro number. One cannot deny the existence of $N^2G_C$ in the grand unification program. This may be considered as the origin of quantum mechanics. The fundamental question to be answered is: In understanding the energy spectrum of Hydrogen atom out of $R_0$ and $\hbar$ which is the primary physical constant?

$$vr \cong \sqrt{\frac{N^2 G_c\ m_e\ R_0}{2}} \cong \frac{\hbar}{m_e} \cong N\sqrt{\frac{G\ m_e\ R_0}{2}}. \tag{35}$$

Guessing that quantum mechanics play a vital role in nuclear physics, nuclear charge radius can be expressed as

$$R_0 \cong \frac{1}{N^2}\left(\frac{\hbar c}{G_C m_e^2}\right)^2 \frac{2G_C m_e}{c^2} \cong \frac{2\hbar^2}{G_A m_e^3} \cong 1.215650083\ fermi. \tag{36}$$

Here $m_e$ is the rest mass of electron and $\frac{2G_C m_e}{c^2}$ is nothing but the classical black hole radius of electron.

$$N^2 \cong \frac{2\hbar^2}{G_C m_e^3 R_0}. \tag{37}$$

$$G_A \cong N^2 G_C \cong \frac{2\hbar^2}{m_e^3 R_0} \cong \left(\frac{\hbar}{m_e c R_0}\right)^2 \frac{2R_0 c^2}{m_e}. \tag{38}$$

Qualitatively this idea represents the Sciama's idea of inertia of the large scale massive universe. Using this incredible expression value of $N^2 G_C$ can be estimated. If Avogadro number is known, value of $G_C$ can be directly estimated from the atomic physical constants accurately.

$$G_C \cong \frac{2\hbar^2}{N^2 m_e^3 R_0} \cong \left(\frac{\hbar}{N m_e c R_0}\right)^2 \frac{2R_0 c^2}{m_e}. \tag{39}$$

Accuracy depends only on the value of $R_0$. But till today its origin is a mystery.

# 7 The nuclear weak force and strong force magnitudes

In classical physics or in cosmology or in black hole physics or in planck scale physics, the operating 'classical force limit' is $F_C \cong \left(\frac{c^4}{G_C}\right)$. Similar to this, the characteristic force limit in atomic or nuclear physics can be given as $\left(\frac{c^4}{G_A}\right)$. It can be expressed as

$$\frac{c^4}{G_A} \cong \frac{c^4}{N^2 G_C} \cong 3.337152088 \times 10^{-4}\ newton. \tag{40}$$

The most surprising observation is that this force magnitude can be termed as the 'nuclear weak force constant' and can be represented as

$$F_W = \frac{c^4}{G_A} \cong \frac{1}{N^2} F_C \cong 3.337152088 \times 10^{-4}\ newton. \tag{41}$$

The utmost important definition is: $N^2$ is the ratio of 'classical force limit' and 'nuclear weak force magnitude'. This is another significance of Avogadro number. Relation between nuclear strong force and weak force can be represented as

$$\sqrt{\frac{F_S}{F_W}} \cong 2\pi \ln\left(\frac{F_C}{F_W}\right) \cong 2\pi \ln\left(\frac{G_A}{G_C}\right) \cong 2\pi \ln\left(N^2\right). \tag{42}$$

where $F_S \cong 157.9944058$ *newton* can be called as the magnitude of the nuclear strong force. Characteristic nuclear size $R_0$ be expressed as

$$R_0 \cong \sqrt{\frac{e^2}{4\pi\epsilon_0 F_S}} \cong 1.208398568 \times 10^{-15}\ m. \tag{43}$$

Absolutely this can be considered as the space-time curvature at the nuclear charge surface provided there exists the atomic gravitational constant $N^2 G_C$. Now the proposed hypothetical dark matter characteristic mass unit can be represented as

$$m_X c^2 \cong \sqrt{\frac{e^2 F_W}{4\pi\epsilon_0}} \cong 1.731843735\ KeV. \tag{44}$$

Its existence has to be confirmed from experiments.

## 7.1 Mystery of proton and neutron rest masses

To a very great surprise it is noticed that,

$$m_p c^2 \cong \left(\frac{F_S}{F_W} + X_E^2 - \frac{1}{\alpha^2}\right) \sqrt{\frac{e^2 F_W}{4\pi\epsilon_0}} \cong 938.1791392\ MeV. \tag{45}$$

Here $m_p c^2$ is the rest energy of proton. This relation indicates that $X_E^2$ is a force ratio. It can be represented as

$$X_E^2 \cong \frac{4\pi\epsilon_0 G_A m_e^2}{e^2}. \tag{46}$$

where $m_e$ is the electron rest mass. Thus $X_E^2$ may be referred to the gravitational and electromagnetic force ratio of electron where the operating gravitational constant is $N^2 G_C$ but not $G_C$. Already $\frac{F_S}{F_W}$ is a force ratio. Hence one can say that $\frac{1}{\alpha^2}$ is also a force ratio or atleast it is related to a force ratio. Based on super symmetry in strong interaction Seshavatharam and Lakshminarayana [3, 25] suggested the same idea. From the above relations and equation (18) qualitatively and quantitatively $\alpha$ can be expressed as

$$\frac{1}{\alpha} \cong \frac{1}{2}\sqrt{X_E^2 - \frac{F_S}{4\pi^2 F_W}} \cong 136.9930484. \quad (47)$$

Neutron and proton mass difference can be expressed as

$$m_n c^2 - m_p c^2 \cong \sqrt{\frac{F_S}{F_W} + X_E^2}\ \sqrt{\frac{e^2 F_W}{4\pi\epsilon_0}} \cong 1.29657348\ MeV. \quad (48)$$

## 7.2 Magnetic moments of electron and nucleons

Interesting idea is that $\sin\theta_W$ can be considered as the ratio of up quark mass and down quark mass. Authors [25] suggested and implemented this idea in particle physics. It can be expressed as

$$\sin\theta_W \cong \frac{Up\ quark\ mass}{Down\ quark\ mass} \cong \frac{1}{\alpha X_E} \cong 0.464433353. \quad (49)$$

Paul Dirac [37] proposed his famous quantum theory of electron in 1928. With reference to the proposed nuclear weak force, magnetic moment of electron can be expressed as

$$\mu \cong \frac{ec}{2}\sqrt{\frac{e^2}{4\pi\epsilon_0 F_W}}\sin\theta_W. \quad (50)$$

Seshavatharam and Lakshminarayana [38] proposed this idea recently. Here $\sin\theta_W$ is the weak coupling angle. Y.K. Gambhir et al [39], N. Kaiser [40], Xiang-Song Chen et al [41] and V. Dimitrsinovic et al [42] discussed about the nucleon magnetic moments in terms of strong interaction. Similarly with reference to the proposed strong nuclear force, magnetic moment of nucleon can be expressed as

$$\mu \cong \frac{ec}{2}\sqrt{\frac{e^2}{4\pi\epsilon_0 F_S}}\sin\theta_W. \quad (51)$$

With reference to the characteristic nuclear radius or proton and neutron radii this relation can be expressed as

$$\mu \cong \frac{ecR_0}{2}\ \sin\theta_W. \tag{52}$$

Interesting observation is that neutron magnetic moment is matching at 0.866 fermi and proton magnetic moment is matching at 1.265 fermi.

## 7.3 The electroweak energy scale

Electron rest energy can be represented as

$$m_e c^2 \cong 2\sin^2\theta_W \times \sqrt{\frac{e^2 F_S}{4\pi\epsilon_0}} \cong 0.514\ MeV. \tag{53}$$

With 96.417% accuracy Fermi's weak coupling constant $G_F$ can be expressed as

$$G_F \cong \frac{\sin^2\theta_W}{\sqrt{2}} \times \frac{F_W}{F_S} \times \hbar c \times \frac{e^2}{4\pi\epsilon_0 F_S} \cong \frac{\sin^2\theta_W}{\sqrt{2}} \times \frac{F_W}{F_S} \times \hbar c R_0^2. \tag{54}$$

Chris Quigg [43] discussed about the estimation of the weak coupling constant. Recommended value of $G_F \cong 1.435841042 \times 10^{-62}\ J.m^3$ and $\frac{G_F}{\hbar^3 c^3} \cong 1.166371 \times 10^{-5}\ GeV^{-2}$. Its obtained value is $G_F \cong 1.487247627 \times 10^{-62}\ J.m^3$ and $\frac{G_F}{\hbar^3 c^3} \cong 1.208129905 \times 10^{-5}\ GeV^{-2}$. Thus it is noticed that,

$$E_W \cong \sqrt{\frac{\hbar^3 c^3}{\sqrt{2} G_F}} \cong \frac{F_S}{F_W} \times m_e c^2 \cong 241.9277486\ GeV. \tag{55}$$

where $E_W$ is the electroweak energy scale. One can say that, ratio of electroweak energy scale and rest energy of electron is close to the proposed strong and weak force ratio. This observation can be given a chance in understanding the 4 fundamental interactions.

## 7.4 The strong coupling constant

If $E_a$ = asymmetry energy constant, $E_c$ = coulombic energy constant of the semi empirical mass formula and $\alpha_s$ = strong coupling constant it is noticed that,

$$F_S \cong \frac{e^2}{4\pi\epsilon_0 R_0^2} \cong e^{\frac{1}{\alpha_s}} \times \frac{2E_a}{E_c} \times F_W. \tag{56}$$

Note that $\frac{E_c}{2E_a}$ plays a crucial role in nuclear stability. Claudia Glasman [44], J. Erler and P. Langacker [45] discussed about the estimation of the strong coupling constant. It can be fitted as

$$\frac{1}{\alpha_s} \cong \ln\left(\frac{E_c}{2E_a} \times \frac{F_S}{F_W}\right). \tag{57}$$

## 7.5 Electron in the Hydrogen atom and in the $\beta$ -decay

In hydrogen atom, force of attraction between proton and electron can be represented as,

$$\frac{e^2}{4\pi\epsilon_0 a_0^2} \cong \left(\frac{E_c}{2E_a}\right)^2 F_W \tag{58}$$

Here $a_0$ is the Bohr radius. It can be expressed as

$$a_0 \cong \frac{2E_a}{E_c}\sqrt{\frac{e^2}{4\pi\epsilon_0 F_W}}. \tag{59}$$

Hence potential energy of electron in hydrogen atom can be given as

$$\frac{e^2}{4\pi\epsilon_0 a_0} \cong \left(\frac{E_c}{2E_a}\right)\sqrt{\frac{e^2 F_W}{4\pi\epsilon_0}} \cong \alpha^2 m_e c^2. \tag{60}$$

$$\alpha^2 \cong \left(\frac{E_c}{2E_a}\right)\sqrt{\frac{e^2}{4\pi\epsilon_0 G_A m_e^2}}. \tag{61}$$

Giving importance to the phenomena of $\beta$ -decay, rest mass-energy of electron can be expressed as

$$m_e c^2 \cong \frac{1}{\alpha^2} \times \frac{E_c}{2E_a} \times \sqrt{\frac{e^2 F_W}{4\pi\epsilon_0}} \cong X_E \times \sqrt{\frac{e^2 F_W}{4\pi\epsilon_0}}. \tag{62}$$

Thus it is noticed that

$$\frac{E_c}{2E_a} \cong X_E \alpha^2. \tag{63}$$

Hence strong coupling constant can be obtained as

$$\frac{1}{\alpha_s} \cong \ln\left(X_E \alpha^2 \times \frac{F_S}{F_W}\right) \cong 8.914475771. \tag{64}$$

That means there is ‘something’ in this proposed ‘atomic gravitational constant’ and that secret has to be find out. The semi empirical mass formula energy coefficients can be obtained in this grand unification program. Nucleons rest masses can be co-related. Authors humble opinion is: in atomic system there exists a gravitational constant whose magnitude is $N^2$ times the classical gravitational constant. Even though this is unbelievable it plays a vital role in the unification of ‘GEWS’ interactions. This can be considered as the beginning of Avogadro’s gravity for nuclear interactions. Seshavatharam and Laksminarayana [27] proposed new ideas in this connection.

# 8 Semi empirical mass formula energy constants

In this section authors made an attempt to couple the famous semi empirical mass formula with the grand unification scheme. In this scheme the new number $X_E \cong 295.0606338$ plays a very interesting role. Let $E_a$ = asymmetry energy constant, $E_c$ = coulomb energy constant, $E_p$ = pairing energy constant, $E_v$ = volume energy constant and $E_s$ = surface energy constant. $X_E$ be defined as follows.

$$X_E \cong \sqrt{\frac{4\pi\epsilon_0 G_A m_e^2}{e^2}} \cong 295.0606338. \tag{65}$$

where $m_e$ is the rest mass of electron. W. D. Myers et al [46] estimated the atomic masses with various energy constants. With reference to the existing nuclear binding energy constants - empirically it can be suggested that

| Z | A | Obtained Be, MeV |
|---|---|---|
| 26 | 56 | 491.3 |
| 44 | 100 | 863.8 |
| 50 | 117 | 997.3 |
| 79 | 197 | 1555.3 |
| 92 | 238 | 1804.1 |

Table 2: Fitting of nuclear binding energy with proposed energy constants.

$$E_p \cong 2X_E\sqrt{\frac{\hbar c^5}{G_A}} \cong 11.96374935\ MeV. \tag{66}$$

$$E_a \cong 2E_p \cong 23.92749869\ MeV. \tag{67}$$

$$\sqrt{\frac{E_a}{E_c}+1} \cong \ln(X_E) \quad \text{and} \quad E_c \cong 0.763383059\ MeV. \tag{68}$$

$$E_a - E_v \cong E_s - E_p \cong 2\ln\left(\frac{X_E}{2}\right)E_c \cong 7.624721443\ MeV. \tag{69}$$

$$E_a + E_p \cong E_v + E_s \cong 3E_p \cong 35.89124805\ MeV. \tag{70}$$

Hence $E_v \cong 16.30277725\ MeV$ and $E_s \cong 19.58847079\ MeV$.

$$\frac{E_c}{2E_a} \cong 0.015952 \cong X_E\alpha^2 \cong 0.015712378. \tag{71}$$

See table-2 for nuclear binding energy. The existing nucleon-proton stability relation can be expressed as

$$Z_S \cong \frac{A}{2+0.0157A^{\frac{2}{3}}} \cong \frac{A}{2+(X_E\alpha^2)\,A^{\frac{2}{3}}}. \tag{72}$$

Here $A$ is the mass number and $Z_s$ is the stable isotope's proton number.

## 8.1 The nuclear stability factor

From the above obtained binding energy constants nuclear stability factor can be defined as

$$S_f \cong \frac{E_a}{E_c}\sqrt{\frac{E_s}{E_c}} \cong 158.7756104. \tag{73}$$

Empirically proton-neutron stability relation can be expressed as

$$A_S \cong 2Z + \frac{Z^2}{S_f} \cong 2Z + \frac{Z^2}{158.776}. \tag{74}$$

Here $Z$ is the proton number and $A_S$ is the stable mass number of $Z$. Roy Chowdhury et al [47] proposed a similar relation. For example, if $Z$= 29, $A_S$= 63.30; $Z$=47, $A_S$ = 107.91; $Z$= 83, $A_S$= 209.39 and $Z$ = 92, $A_S$ = 237.30; By considering $A$ as the fundamental input its corresponding stable Z = $Z_S$ can be obtained as

$$Z_S \cong \left[\sqrt{\frac{A}{S_f}+1}-1\right] S_f. \tag{75}$$

Surprisingly it is noticed that this number $S_f$ plays a crucial role in fitting the nucleons rest mass. Interesting observation is that

$$(m_n - m_p)\, c^2 \cong \ln\left(\sqrt{S_f}\right) m_e c^2. \tag{76}$$

Here $m_n$, $m_p$ and $m_e$ are the rest masses of neutron, proton and electron respectively.

## 8.2 The strong coupling constant and the nuclear stability factor

Semi empirically inverse of the strong coupling constant can be expressed as

$$\frac{1}{\alpha_s} \cong \ln\left(X_E^2\sqrt{\alpha}\right) \cong 8.914239916 \cong \frac{1}{0.112180063}. \tag{77}$$

This is a very interesting definition. Now the nuclear stability factor can be defined as

$$S_f \cong \frac{2}{\alpha_s^2} \cong 158.9273465. \tag{78}$$

## Conclusion

Authors showed many applications of the existence of the atomic gravitational constant. Its existence as a 'true grand unified nuclear physical constant' can be confirmed. Reality can be understood only with interest, involvement and logical analysis. Now time has come to measure the value of the gravitational constant in atomic and nuclear space time curvature. Observing 'dark matter' is a very interesting and important job in cosmology. For any particle physicist it is very important to know its massive origin. In this paper a simple idea is proposed for understanding the massive origin of dark matter. For any new idea, for any physicist the final step is: 'to see/feel it experimentally' or 'to observe its direct and indirect implications'. Authors are working in this direction also. Note that human beings are part of this universal gravity. There are some natural restrictions to experiments. In a grand unified program 'absolute findings' can be understood but 'absolute measurements' can not be made by human beings. Authors request the whole science community to kindly look into this new approach.

## Acknowledgements

Authors are very much thankful to the Hadronic journal, Journal of nuclear physics, Progress in Physics and International journal of modern physics E for giving life to this new subject, that couples unification, particle physics and cosmology. First author is very much thankful to professor S.Lakshminarayana, Dep. of Nuclear physics, Andhra university, India for his kind and valuable guidance. Same author is very much thankful to Dr. K. V. Krishna, IIT, Gauhati, India for his kind and valuable guidance. Authors are very much grateful to Dr. S. G. Fedosin for his kind and valuable discussions and updating the data on strong gravitational constant in Wikipedia. Authors are very much thankful to the referee for his kind and valuable comments and guidance.

# References

[1] J.V.Narlikar. An Introduction to Cosmology. 3rd edition, Cambridge University Press.

[2] U. V. S. Seshavatharam. Physics of Rotating and Expanding Black Hole Universe. Progress in Physics, vol. 2, April, 2010, p. 7-14.

[3] U. V. S. Seshavatharam and S. Lakshminarayana. Unified model of universe and the atom. Book. LAP Alembert publishers, Germany. March 2011.

[4] Hawking S.W. A Brief History of Time. Book. Bantam Dell Publishing Group. 1988.

[5] Abdus Salam. Einstein's Last Dream: The Space -Time Unification of Fundamental Forces, Physics News, Vol.12, No.2 (June 1981), p.36.

[6] David Gross. Einstein and the search for Unification. Current science, Vol. 89, No. 12, 25 Dec 2005.

[7] Tilman Sauer. Einstein's Unified Field Theory Program. The Cambridge Companion to Einstein, M. Janssen, C. Lehner (eds), Cambridge University Press.

[8] Salam A. and Sivaram C. Strong Gravity Approach to QCD and Confinement. Mod. Phys. Lett., 1993, v. A8(4), 321-326.

[9] Abdus Salam. Strong Interactions, Gravitation and Cosmology. Publ. in: NATO Advanced Study Institute, Erice, June16-July 6, 1972 ; in: High Energy Astrophysics and its Relation to Elementary Particle Physics, 441-452 MIT Press, Cambridge (1974).

[10] Salam A, A.H. Chamseddine and J. Strathdee. Strong Gravity and Super symmetry. ICTP, Trieste preprint IC/77/148 Publ. in: Nucl. Phys. B136, 248-258.

[11] J. Dufour. Very sizeable increase of gravity at pico-meter distance: a novel working hypothesis to explain anomalous heat effects and apparent transmutations in certain metal hydrogen systems. J. of condensed matter nuclear science, 2007, Vol.1, p. 47-61.

[12] Sivaram. C and Sinha. K.P. Strong gravity, black holes, and hadrons. Physical Review D, 1977, Vol. 16, Issue 6, P. 1975-1978.

[13] V. de Sabbata, C. Sivaram. Strong Spin-Torsion Interaction between Spinning Protons.
(http://prints.iiap.res.in/bitstream/2248/4394/3/Strong

[14] Usha Raut, K. P. Sinha. Strong Gravity and the Yukawa Field. International Journal of Theoretical Physics, Vol. 20, No. L 1981.

[15] Oldershaw R.L. Discrete Scale Relativity. Astrophysics and Space Science, 2007, Vol. 311, N. 4, P. 431-433. DOI: 10.107/s10509-007-9557-x.

[16] Stone R.A. Quark Confinement and Force Unification. Progress in Physics, April 2010, Vol. 2, p. 19-20.

[17] K. Tennakone. Electron, muon, proton, and strong gravity. Phys. Rev. D, 1974, Volume 10, Issue 6, P.1722-1725.

[18] Recami E, Ammiraju P, Hernandez H.E, Kretly L.C, Rodrigues W.A. Jr. Elementary particles as microuniverses: a geometric approach to 'strong gravity'. Apeiron, January 01, 1997.

[19] Recami E and Tonin-Zanchin V. The strong coupling constant: its theoretical derivation from a geometric approach to hadron structure. Found. Phys. Lett., 1994, v, 7(1), 85-92.

[20] Erasmo Recami, Tonin-Zanchin, Antonino Del Popolo, Mario Gambera. The strong coupling constant, Heavy Ion Physics,1999, Vol. 10, P. 345-349.

[21] Stanislav Fisenko and Igor Fisenko. The Conception of Thermonuclear Reactor on the Principle of Gravitational Confinement of Dense High-temperature Plasma. Applied Physics, November 2010, Vol. 2, No. 2, P. 71-79.

[22] S. I. Fisenko, M. M. Beilinson and B. G. Umanov. Some notes on the concept of “strong” gravitation and possibilities of its experimental investigation. Physics Letters A, Volume 148, Issues 8-9, 3 September 1990, p. 405-407.

[23] Perng J. J. Strong gravitation and elementary particles. Nuovo Cimento, Lettere, Serie 2, vol. 23, N. 15, 1978, p. 552-554.

[24] Fedosin S.G. Model of Gravitational Interaction in the Concept of Gravitons. Journal of Vectorial Relativity, Vol. 4, No. 1, March 2009, P.1-24.

[25] U. V. S. Seshavatharam and S. Lakshminarayana. Super symmetry in strong and weak interactions. Int. J. Mod. Phys.E, Vol.19, No.2, (2010), p.263-280.

[26] U. V. S. Seshavatharam and S. Lakshminarayana. Strong nuclear gravitational constant and the origin of nuclear planck scale. Progress in Physics, vol. 3, July, 2010, p. 31-38.

[27] U. V. S. Seshavatharam and S. Lakshminarayana. Role of Avogadro number in grand unification. Hadronic journal, Vol 33, num 5, Oct 2010, p.513.

[28] U. V. S. Seshavatharam and S. Lakshminarayana. (N/2) neutrons, (N/2) protons and (N/2) electrons. Published online in Journal of Nuclear Physics, Italy. Nov 2010.

[29] U. V. S. Seshavatharam and S. Lakshminarayana. Avogadro’s Gravity for Nuclear Interactions (AGNI). Abstract published in Journal of Nuclear Physics, Nov 2010.

[30] W. C. Daywitt. The Planck Vacuum. Progress in Physics, vol. 1, Jan, 2009, p.20-26.

[31] N. Haramein et al. The Origin of Spin: A Consideration of torque and coriolis forces in Einstein's field equations and Grand unification theory. 153-168, 2005. The Noetic Press, Printed in the United States of America. http://theresonanceproject.org/.

[32] Joshua A. Frieman et al. Dark energy and the accelerating universe. http://arxiv.org/abs/0803.0982v1.

[33] Lorenzo Romano Amedeo Carlo Avogadro. Essay on a Manner of Determining the Relative Masses of the Elementary Molecules of Bodies, and the Proportions in Which They Enter into These Compounds. Journal de Physique, 1811.

[34] P.J. Mohr and B.N. Taylor. CODATA Recommended Values of the Fundamental Physical Constants.2007. Http://physics.nist.gov/constants.

[35] Particle Data Group (W.-M. Yao et al.), J. Phys. G 33 (2006) 1, http://pdg.bbb.gov.

[36] Geiger H and Marsden E. On a diffuse reflection of the particles. Proc. Roy. Soc., Ser. A 82: 495-500, 1909.

[37] P.A.M. Dirac, The quantum theory of the electron, Proc. Roy. Soc. Lon. A117, 610 (1928).

[38] U. V. S. Seshavatharam and S. Lakshminarayana. Atomic gravitational constant and the origin of elementary magnetic moments. To be published in the Hadronic journal.

[39] Y.K. Gambhir and C.S. Warke, Nuclear magnetic moment: Relativistic mean field description. Pramana, Vol. 53, No. 2, August 1999 pp. 279-288.

[40] N. Kaiser. Pion-photon exchange nucleon-nucleon potentials. Physical Review. C 73, 044001 (2006)

[41] Xiang-Song Chen et al. Spin-orbital structure of the nucleon magnetic moment. Physical Review C 69, 045201 (2004)

[42] V. Dimitrsinovic and S. J. Pollack. Isospin breaking corrections to nucleon electroweak form factors in the constituent quark model. Physical Review.C, Vol 52, num 2 Aug 1995.

[43] Chris Quigg. The Electroweak Theory. Fermi National Accelerator Laboratory. http://arxiv.org/abs/hep-ph/0204104v1.

[44] Claudia Glasman. Precision Measurements of alphas at HERA. (http://arxiv.org/abs/hep-ex/0506035v1)

[45] J. Erler and P. Langacker. Electroweak model and constrains on new physics. W.-M. Yao et al., Journal of Physics G 33, 1 (2006). (http://pdg.lbl.gov/)

[46] W. D. Myers et al. Table of Nuclear Masses according to the 1994 Thomas-Fermi Model.(from nsdssd.lbl.gov)

[47] P. Roy Chowdhury et al. Modified Bethe-Weizsacker mass formula with isotonic shift and new driplines. (http://arxiv.org/abs/nucl-th/0405080).